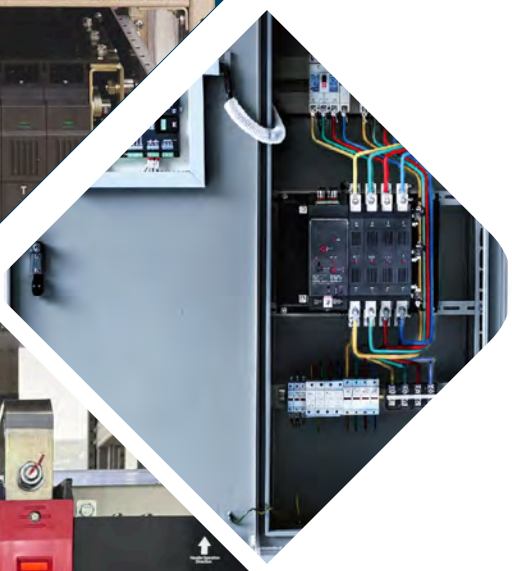
POWER TECHNOLOGIES™
Private Limited

PTS™

LOW VOLTAGE AUTOMATIC TRANSFER SWITCHES



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The Power Transfer Switchgear (PTS) Dual Power is a cutting-edge, highly reliable automatic transfer switch designed to ensure seamless power supply transitions. Built in accordance with **IEEE 446, 666, 241, 242 recommended of design for emergency and standby systems**, it undergoes independent testing to meet stringent international standards, including **GB14048.11-2008, EN/IEC 60947-6-1-2021 + 2023, Class Power Control (Class PC), UL 1008 and CSA C22.2.** Committed to environmental safety, PTS adheres to the RoHS Directive **(EU 2015/863)**, ensuring restricted use of hazardous substances in electrical and electronic equipment.

With smart, versatile features, PTS Dual Power is ideal for critical applications in diverse fields such as electrical equipment, automation systems, power plant commissioning, telecommunications, petrochemicals, hospitals, data centers, and smart buildings. Its robust reliability makes it a preferred choice in sectors including coal, metallurgy, railways, and municipal engineering, providing secure, uninterrupted power across demanding environments. Complying with NEC standards, including **NEC 700** (emergency), **NEC 701** (legally required), **NEC 702** (optional standby), and **NEC 708** (critical operational systems), the PTS Dual Power is particularly suited for special occupancies such as healthcare facilities **(NEC 517)**. Available in both standard and custom configurations.



Enclosure Structure: Optimized for Durability and Access

Sophisticated Finish: Our enclosures boast a sleek, Gray (RAL 7035) finish, achieved through a meticulous electrostatic powder coat process. This process includes a multi-step preparation of surfaces involving degreasing, rinsing, and iron phosphate coating, followed by a non-chemical sealing and dual oven phases for drying and curing the paint. This thorough application ensures a durable, corrosion-resistant finish ideal for both the interior and exterior of the enclosure.

Robust Frame Construction: The structural integrity of our enclosures is guaranteed by a stout frame made from steel, engineered to provide steadfast rigidity and withstand rigorous conditions.

Secure and Functional Doors: Doors crafted are securely hinged to the frame. These doors feature a locking mechanism that accommodates a key lock, ensuring secured access. The layout of the door allows mounted automatic controllers and device panels to be easily accessible, facilitating quick maintenance and monitoring. Doors are designed to open at a minimum angle of 90 degrees for optimal accessibility.

Accessible Covers for Easy Maintenance: Our enclosures include side and rear bolted covers made from steel, designed to be split into upper and lower sections for easier handling. These covers are easily removable, providing convenient access to cable terminations and internal components for hassle-free installation and maintenance.

Utility of Lifting Brackets: Strategically placed at the top of freestanding enclosures, the lifting brackets can be extended and locked in place for safe and efficient transport of the switch. When not in use, these brackets can be seamlessly retracted to maintain the enclosure's compact profile.

Versatile Mounting Options: Featuring multiple mounting points at its base, the enclosure can be securely anchored to the floor. Wall-mounted configurations include additional mounting points at the top and bottom for secure vertical installation.

IEC/NEMA Compliance and Flexibility:

Wide Range of Enclosure Types: Available in IEC (60529), our Class PC-type transfer switch enclosures cater to diverse environmental and operational needs. The standard offerings include steel constructions with a protective gray finish.

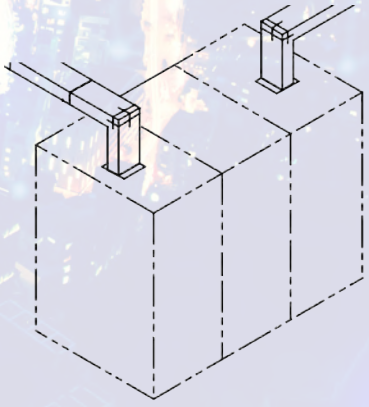
Adaptable for Varying Environmental Conditions: For enhanced air quality control, our enclosures can be equipped with vented panels and replaceable air filters, making them suitable for both indoor and outdoor applications.

Innovative Power Connection Solutions:

Reliable Power Bus Configurations: Our standard tin-plated bus meets the typical demands of most installations. For settings prone to chemical exposure, to prevent the growth of conductive filaments, ensuring safety and longevity.

Flexible Connection Methods: Power connections are facilitated via screw-type mechanical lug terminals.

Customizable Busway Integration: The enclosure's design allows for busway connections through the roof or via additional side cabinets, with provisions for increasing enclosure depth if needed, accommodating a range of busway installation scenarios.



Automatic Transfer Switch - Busway Flange Connection

Cable Entry and Configuration Options for ATS

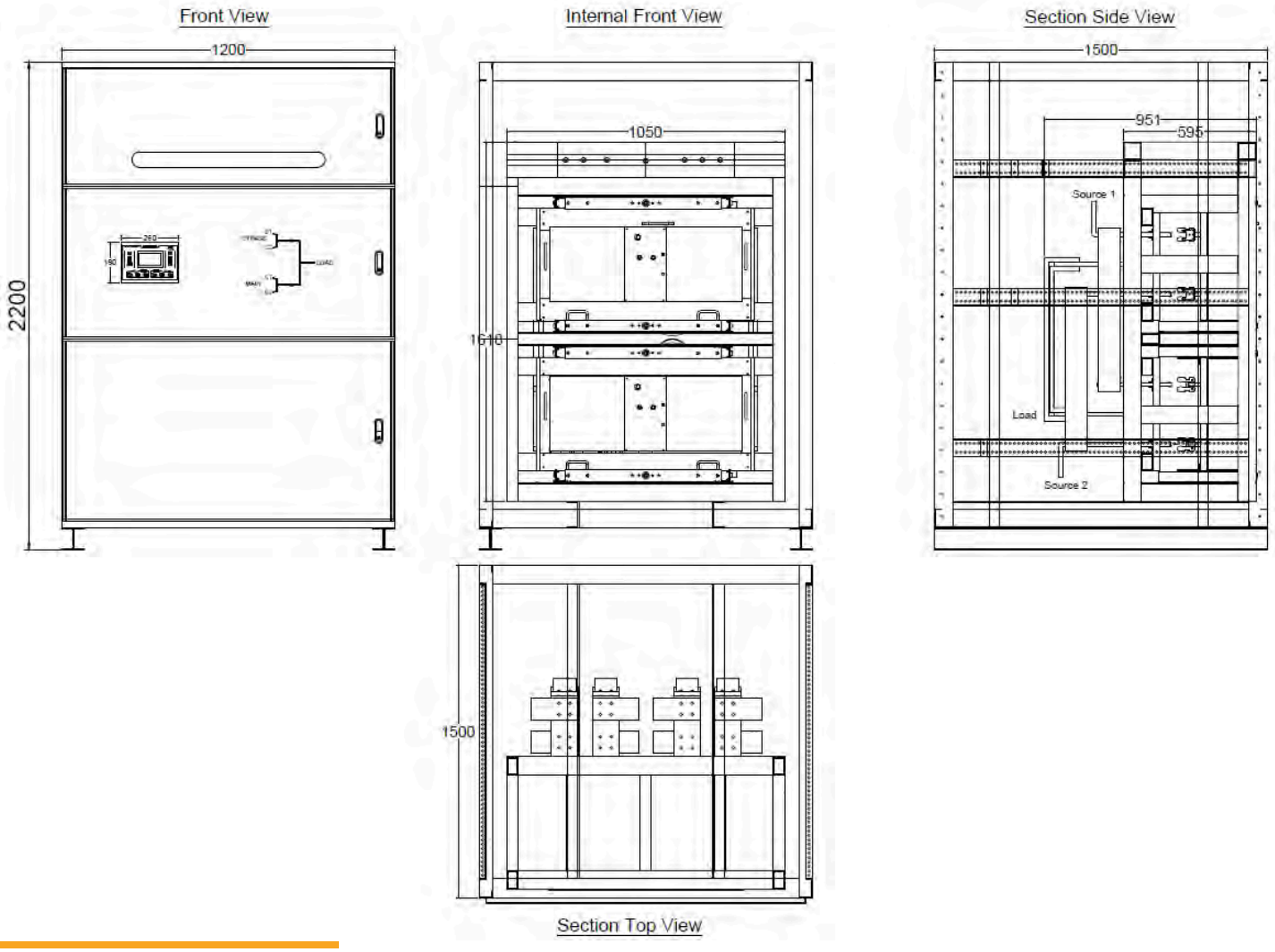
Adaptable Entry Points: Our Solenoid-type automatic transfer switches (ATS) are innovatively designed to support cable entries from both the top and bottom, ensuring seamless integration into any system layout. Wall-mounted models feature primary power connections at the upper sections for straightforward access, while emergency and load power connections are strategically placed lower to enhance system stability and safety.

Specialized Configurations for Bypass Isolation: Our bypass isolation ATSs are available exclusively in freestanding enclosures. They are pre-configured at the factory to accommodate various cable entry points—top or bottom, as per your operational needs. Units with a fixed automatic bypass switch come with preset cable connections, whereas those with a drawout switch offer field-adjustable configurations, ensuring flexibility and adaptability in any setup.

Freestanding Setups: In freestanding units, the configuration optimizes space and accessibility: normal power connections are positioned near the top, emergency power at the bottom, and load connections centrally located to balance the system's physical and electrical demands. The unique 'source swap' feature offers customization by allowing the reversal of normal and emergency power connections to suit specific installation needs.

Enhanced Customization Through Modular Design: To meet diverse installation demands, freestanding enclosures can be modified in depth or supplemented with a side cabinet, providing ample space for all cable management requirements. Removable panels on all models ensure easy access to cable terminations, allowing for quick maintenance and adjustments.

This flexible design philosophy ensures our ATS systems can seamlessly integrate into existing infrastructures, providing reliable power management solutions tailored to the unique demands of any installation.



PTS™ Mechanism

Power Pole Configuration

Each pole within the assembly features dual main contacts, crafted from high-conductivity silver alloy. These contacts are both electrically actuated and mechanically stabilized, ensuring robust and reliable operation. As a result of mechanically held poles, sturdy performance is maintained regardless of any type of mechanical shock(s). A dual interlocking system—mechanical and electrical—guards against the simultaneous connection of the power sources. Visual status indicators via colored flags display the active power source, ensuring clear and immediate feedback on operational status.

Structural Encasement

Encasing the power poles is a rigid structural housing meticulously crafted from materials chosen for their exceptional mechanical strength and superior dielectric properties. This housing is engineered to withstand severe dynamic forces, high thermal stresses, and environmental challenges, ensuring it remains robust and reliable even under the most demanding conditions. compromise performance.

Arc Management System

Positioned strategically over each set of main contacts are removable arc chutes within dedicated arc chambers. These chambers are essential for directing and dissipating arc gases efficiently, guided by the arc chutes. Constructed from strategically arranged metal plates and covered by a specially designed baffle, the arc chutes are instrumental in extinguishing electrical arcs swiftly, thereby extending the lifespan of the main contacts. For maintenance and inspection, these arc chutes can be easily detached to allow direct access to the underlying contact mechanisms.

Solenoid-Driven Mechanism

ATS units use an electrically operated solenoid to open or close main contacts for efficient power transfer. Automatic models feature microprocessor-based controllers that monitor power conditions and manage seamless transfers. Manual models rely on local or remote switch panels for user-initiated operation, with control power sourced from the designated power supply for reliability.

Overlapping Neutral Configurations in Transfer Switches

For three-phase power systems that require switching of the neutral conductor, transfer switches can be equipped with a fully rated fourth pole, which functions identically to the individual phase power poles (A, B, C).

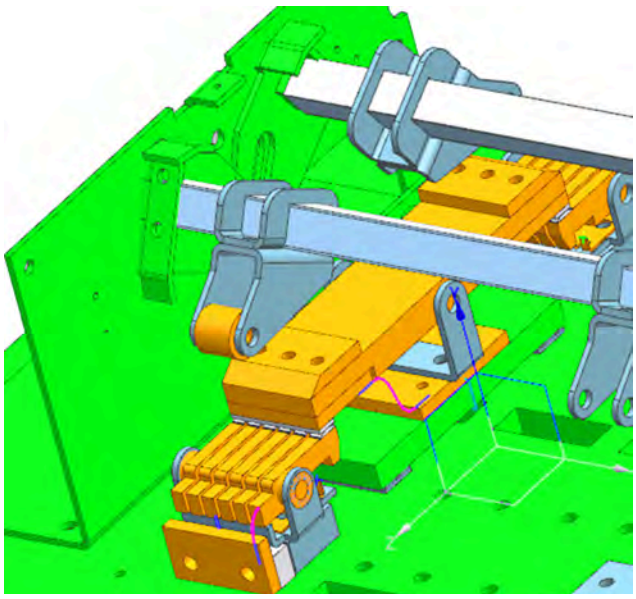
Overlapping Neutral Benefits: An Overlapping neutral is beneficial when the transfer switch sources power from independently derived systems. IEEE 242 advantages include:

- **Prevention of Circulating Ground Currents:** Stops ground currents from flowing between power sources via the neutral conductor, which can otherwise cause nuisance tripping of ground fault relays at the de-energized or unconnected source.

- **Protection of Ground Fault Relay Sensitivity:** Ground fault protection systems rely on precise current measurements to detect faults. If a neutral is not overlapping, parallel grounding paths may form between power sources, reducing the effectiveness of ground fault relays and leading to false readings or delayed response times. An overlapping neutral ensures that the ground fault relay at the connected source remains accurate, sensitive, and fully functional, enhancing overall system safety.

Simplification of Installation with 4 Pole ATS:
Implementing a 4 Pole ATS reduces the complexity of electrical system design and installation. Without it, additional ground fault sensing wiring is often required to detect and prevent improper neutral-to-ground connections. By integrating a fully rated neutral pole within the transfer switch, the need for extra wiring is eliminated, resulting in a more streamlined setup, improved reliability, and reduced labor and material costs.

Overlapping Neutral : In some cases, there is a concern of probability of unequal voltage distribution to the loads on three phases, at the instant of the closure of ATS to the available power supply. The probability of unequal voltage distribution is due to the conceived delay in closure of neutral pole reference to the closure of phases. This may arise a situation where there may be unequal voltage distribution along the loads on different phases due to missing neutral reference. To overcome this concern, the ATS with overlapping neutral can be used. Here the neutral of both power sources remain connected during the transfer for 100 milliseconds or less. The load side will always have neutral reference connected erasing the concern of unequal voltage distribution.



Overlapping Neutral

Closed Transition Switches: In switches with closed transitions, the phases pole operates in a make before break fashion, with overlapping or simultaneous closure of neutral contacts restricted to 100 milliseconds or less.

Open Transition Switches: Conversely, in open transition configurations, the phases pole operates as "break-before-make," avoiding issues that may arise with a solid three-pole neutral configuration.

Configuration Trade-offs

Three-Pole Configuration

Advantages: Lower cost.

Disadvantages: Potential for nuisance tripping of the ground fault relay; added complexity in ground fault relay circuit implementation.

Three-Pole (Solid Neutral) Configuration

Advantages: Potentially less expensive than four-pole configurations. Availability of neutral all times.
Disadvantages: Lead to circulating neutral current is there are difference in voltage potential between two sources.

Four-Pole (Overlapping Neutral) Configuration

Advantages: Eliminates circulating ground currents and associated relay tripping issues.

Disadvantages: Higher cost

Bypass Isolation Automatic Transfer Switches These switches provide dual switching functionality for enhanced reliability and simplified maintenance in critical settings. The primary mechanism manages daily power distribution, while a secondary (Bypass) mechanism acts as a backup. This setup is particularly beneficial in healthcare and other critical applications where uninterrupted power is crucial. During maintenance, the bypass allows for continued power supply, ensuring that critical systems remain operational. The bypass switch can also be automatic, adding an extra layer of redundancy by monitoring and automatically transferring power if the primary source fails. These systems comply with IEEE 446 / NFPA 110 standards, allowing for regular maintenance, inspection, and testing.

Installation types for transfer switches based on NFPA 70

Installation Type	Description	Regulatory Compliance and Transfer Timing
Emergency Systems	Supports critical life safety functions during emergencies in buildings like hospitals and arenas. Includes systems like fire alarms and emergency lighting.	Must transfer to emergency power within 10 seconds according to Article 700 of NFPA 70. Requires selective coordination of overcurrent devices.
Legally Required Systems	Provides power to essential services not classified as emergency but crucial for safety during outages, such as heating and lighting.	Transfer to emergency power must be completed within 60 seconds per Article 701 of NFPA 70. Overcurrent devices must be selectively coordinated.
Critical Operations Power Systems (COPS)	Powers designated critical areas vital to national security, economy, or public health, including HVAC and security systems.	Complies with Article 708 of NFPA 70. All overcurrent devices must be selectively coordinated with supply-side devices.
Optional Standby Systems	Supplies power to non-essential loads, typically in commercial buildings and residences, without automatic operation during outages.	Adheres to Article 702 of NFPA 70, without requirements for automatic operation during power failures.
Special Occupancies	Pertains to healthcare facilities, powering systems critical to patient care and safety.	Governed by Article 517 of NFPA 70, aligning with NFPA 99 and NFPA 110 for comprehensive standards adherence.

Mounting Options for Power Transfer Switches

Standard and Bypass Isolation Configurations

Robust construction options are available for its Class PC-type transfer switches. Standard models feature a fixed-mounted power switch, optimizing stability and cost-effectiveness. For enhanced flexibility and maintenance, the bypass isolation automatic transfer switches incorporate dual configurations: either both components as draw-out or a hybrid of draw-out and fixed. Specifically, the ATS is designed with a drawout mechanism in the lower compartment, while the automatic bypass switch in the upper compartment can be selected as either fixed or drawout based on operational needs.

Drawout Configuration

Conversely, the drawout option introduces enhanced versatility and ease of maintenance. This configuration houses the power switch within a robust steel cassette, featuring a built-in control power connection. At the rear, finger clusters smoothly engage with the main bus stabs, allowing for secure electrical connections. The cassette is supported by movable extension rails, facilitating easy handling and extraction of the power switch using a standard ratchet drive extension. This method significantly simplifies the processes of inspection, maintenance, and replacement without disrupting the system's operation.

Handling and Mobility Solutions

For operational convenience, we provide lifting tools such as trucks, hoists, and yokes, specifically designed for the safe removal of both fixed and drawout power switches. These tools are essential for handling heavy components in larger installations, ensuring that maintenance and upgrades can be performed safely and efficiently.

Drawout Mounting

This mounting style allows the switching mechanism to be positioned in three states within a cassette or cell: connected, disconnected, and withdrawn. This versatility supports safety, ease of testing, and serviceability. Drawout mechanisms are essential for bypass isolation transfer switches in critical applications, allowing for easy maintenance and lockout/tagout procedures. They typically operate on rail slides or rollers and can be removed for bench testing or replacement.

Integration with Bypass Isolation and Hot Swappable Functionality

A Bypass Isolation Switch (BIS), when integrated within a three-door compartmentalized bypass isolation transfer switch, offers a heightened level of safety for service technicians. This configuration enables critical loads to remain powered while facilitating secure maintenance operations.

The two-position MIS can be adjusted to isolate the control compartment from system and control voltages, reducing electrical shock risks. Hot-swappable components allow for replacing or servicing key modules without interrupting power, minimizing downtime and ensuring continuous operation during maintenance or failures.

Leading the Industry in Power Transfer Solutions, Delivering the Most Advanced and Reliable Transfer Switches

IDCA SDS CERTIFIED SYSTEM SYS486411084 G1.G2.G3.G4.Applicable

PTS-WN3 Series

The PTS-WN3 Series Power Transfer Switch is available in the conventional, three-position transfer configuration and closed or delayed transition modes of operation. Additionally, switched or overlapping neutral options provide for the reliable operation of ground fault protection systems and the reduction of voltage transients from unbalanced load switching.

PTS-WN3 Double Throw Automatic Transfer Switches are the standard of the industry. High-speed transfer of loads between alternate power sources, regardless of ampacity size, is achieved by a reliable, field proven double throw solenoid operating mechanism. When combined with a programmable microprocessor controller with LCD display, they offer the most advanced method of transferring all types of loads, such as, motors, electronic drives, UPS's and microprocessor based systems. PTS Series automatic transfer switches are available open or enclosed, in ampacity sizes from 32 through 6300 amperes with the largest selection of optional accessories offered anywhere.

Ampere Interrupting Capacity (AIC) Ratings

Ampere Rating	16 - 160	200-250	300 - 500	630 - 800	1000 - 1250	1600 - 2600	3000 - 3200	4000 -6300
Utilization Category	AC - 33A/B	AC - 33A/B	AC - 33A/B	AC - 33A/B	AC - 33A/B	AC - 33A/B	AC - 33A/B	AC - 33A/B
Withstand Short Time Rating (KA)	10 - 15	20-35	20 - 40	35 - 55	40-65	50 - 85	65 - 85	80 -100
Rated Conditional Short Circuit Current (KA) FUSE	200	200	200	200	200	200	200	200
Time Based (400V Max.)	10kA 0.025sec	15kA 0.025sec	35kA 0.05sec	40kA 0.05sec	50kA 0.05sec	65kA / 0.05sec	85kA / 0.05seC	100kA 0.05sec
Rated Operating Voltage (V)	AC - 400/690	AC - 400/690	AC - 400/690	AC - 400/690	AC - 400/690	AC - 400/690	AC - 400/690	AC - 400/690
Impulse Withstand Voltage (KV)	8	8	8	8	8	8	8	8
Rated Insulation Voltage (V)	1000	1000	1000	1000	1000	1000	1000	1000

Note: When protected by circuit breaker, the instantaneous trip is required, The maximum fault clearance time shall be less that time duration shown on the withstand rating.

PTS WN3 Series

The PTS-WN3 Series ATS enables efficient load transfer between alternate power sources. Available in two sizes—one for lower ampere loads and another for higher ampere loads—these switches can be customized to match specific load requirements and configured for either closed or open transitions with or without bypass isolation.

These switches are equipped with a microprocessor controller for precise operation. Reliable, efficient, and tailored for performance, these switches are the ideal solution for your load transfer requirements.

- **Configuration Options:** Available in open and enclosed models
- **Ampacity Range:** Supports loads from **32 to 6300 amperes.**

PTS-WN3 Closed Transition Series

PTS WN3 Series include:

- Open Transition Transfer Switch (PTS-WN3)
- Closed Transition Transfer Switch (PTS-WN3CT)
- Manual Closed Transition Transfer Switch (PTS-WN3MCT)
- Delayed Transition Transfer Switch (PTS-WN3D)
- Open Bypass Isolation Transfer Switch (PTS-WN3B)
- Closed Bypass Isolation Transfer Switch (PTS-WN3BCT)
- Drawout type transfer switch (optional)

PTS-WN3B- 2600A-4P Open Transition Transfer Switches with Maintenance Bypass

PTS-WN3CT-250A-4P Closed Transition Transfer Switches (Fire Pump Panel)

PTS-WN3-1600A-4P Open Transition Transfer Switches

PTS WN3 Series

Product Features

General Features

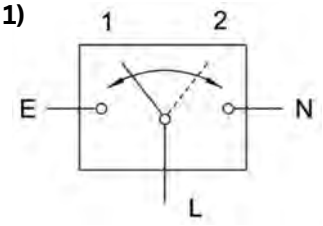
- Transfer Model : ATS
- Class : PC
- Utilization Category : AC-33A / AC-33B
- Rated up to 400/690 VAC
- Sizes from 32 through 6300 amperes
- Optimal Design of 800 through 6300 amperes Driven by Dual-driving mechanism.

Certifications

- IECEE CB Scheme IEC 60947-6-1: 2021 + 2023
- CCC Certified compliant with GB/T 14048.11-2008
- UL 1008:2022
- CSA C22.2 #178.1:2022

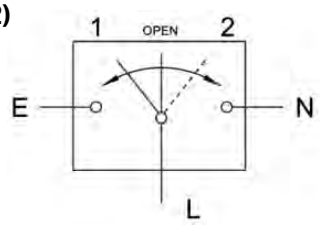
Transition Types

1)



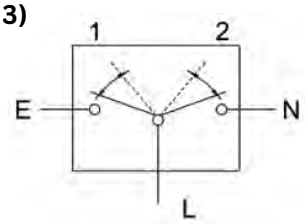
Standard Type

2)



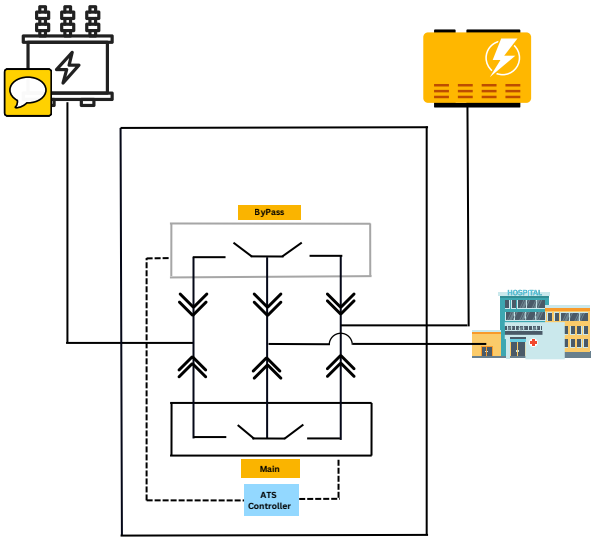
Delayed Transition

3)



Closed Transition

1) Open Transition Type with standard switching neutral. Overlapping neutral conductor (options).
2) Delayed Transition PTS-WN3 Series Automatic Transfer Switch has 3 positions, conventional two-position transfer configuration, plus closed and delayed transition modes of operation.
3) Closed Transition Transfer Switches, Source momentarily parallel time of less than 100 milliseconds, Closed transition operation (no power interruption) during transfer (manual mode) and re-transfer when sources are within specified parameters.
4) All configurations available with either **automatic** or **non-automatic** control.
5) A two-way bypass mechanism in an Automatic Transfer Switch (ATS) ensures uninterrupted power supply by allowing direct connection between the power source (utility or generator) and the load during ATS maintenance or failure. It typically includes a manual or automatic bypass switch that isolates the ATS for servicing while maintaining power to critical loads. Equipped with safety interlocks to prevent simultaneous source connections, the bypass system is designed to operate seamlessly, often in a non-load break manner to avoid interruptions. This feature enhances reliability, reduces downtime, and simplifies maintenance without disrupting the power supply to essential systems.



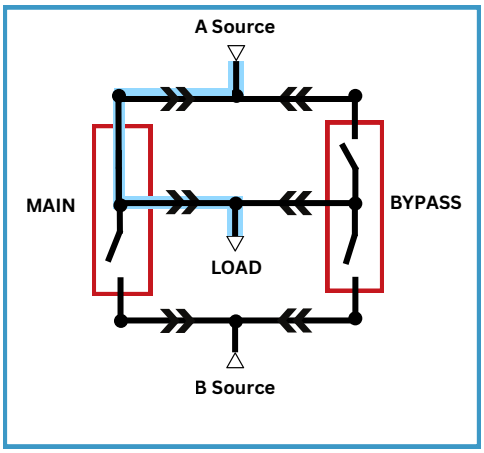
5) Two Way Bypass Mechanism

- Electrically operated and mechanically held and double throw type.
- Mechanical interlocked contact mechanism.
- Fast Contact time 30-100msec.
- High withstand and close-on with reliable and field-proven solenoid operating mechanism ensures maximum performance.
- The switch can positively locked and unaffected by momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
- The top and bottom interlocking mechanisms serve as crucial safety features these interlocks help prevent unintentional switching or unauthorized tampering, which could otherwise lead to costly equipment damage, system downtime, or even serious safety incidents.

Operating Procedure for a two way Bypass Isolation

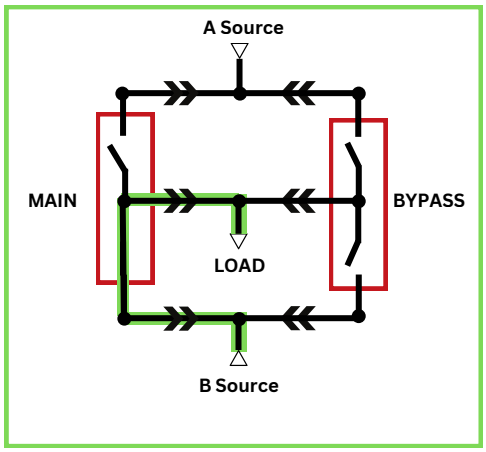
Normal Operation

This mode shows how the ATS operates under standard conditions, with a diagram depicting the flow of power from two sources (A and B) to the load. The power can be routed directly or bypassed around the ATS.

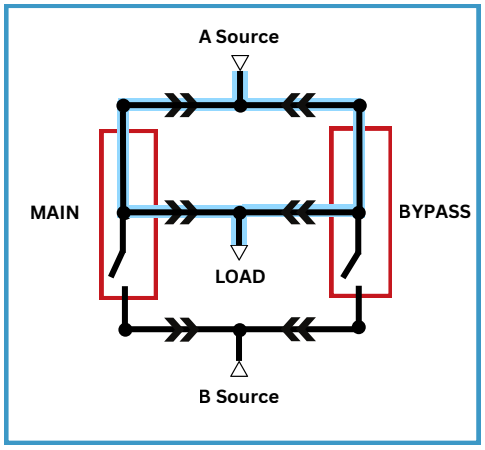


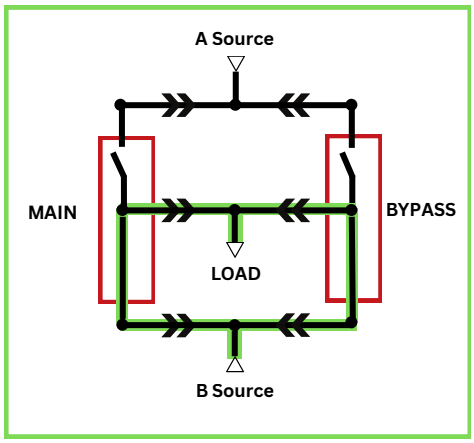
Emergency Operation

This mode displays the system's operation in an emergency, indicating that if one source fails, the ATS can still supply power from the remaining source directly to the load or via a bypass

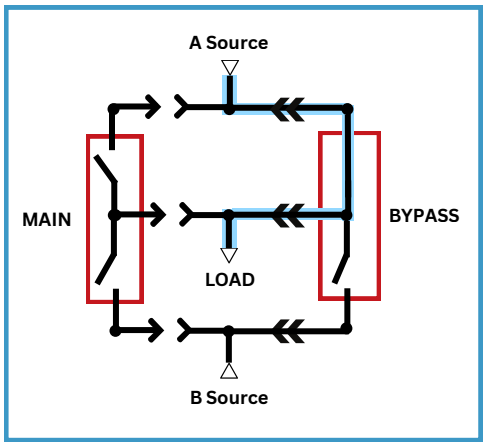


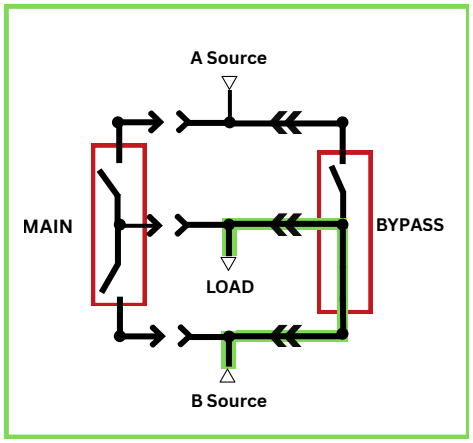
This section depicts a configuration for checking and testing the ATS. It shows that the ATS can be configured to check both power sources simultaneously or each source individually while bypassing the ATS.





This section illustrates the ATS in an isolated position, indicating a maintenance or test mode where the ATS is disconnected from both power sources, ensuring safety during inspection or maintenance.

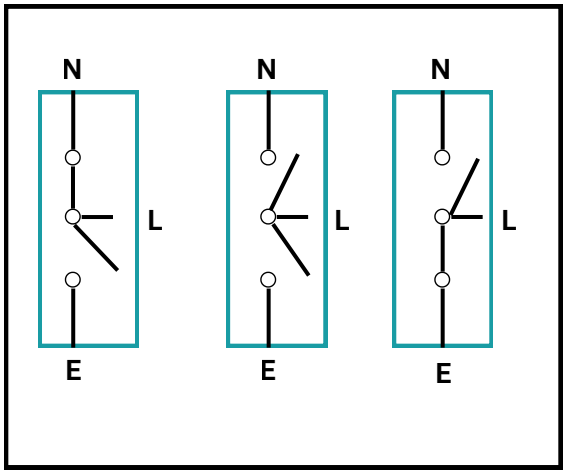




Sequence Operation (CTTS)

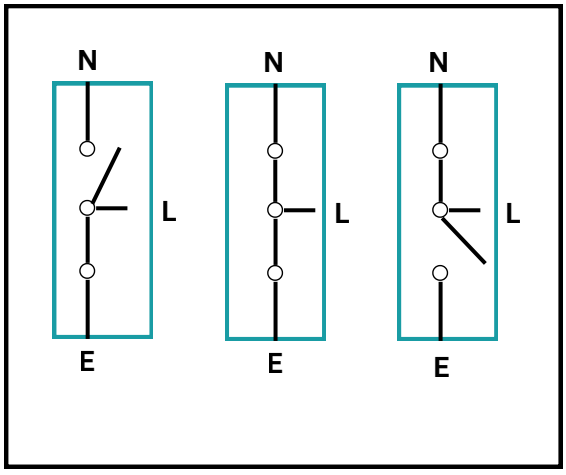
General ATS System
Open Transition Transfer Switch Function

Simplest form of an ATS where the switch transitions between the normal (N) and emergency (E) power sources. The transfer involves a break before make, which means there is an interruption in power supply during the switch.



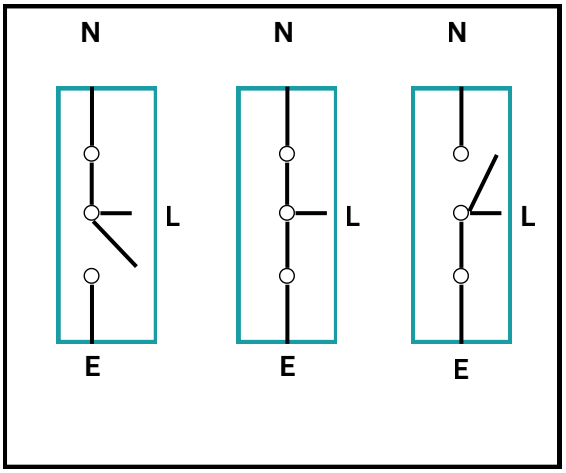
Closed Transition Transfer Switch (CTTS) Uninterrupted Power Supply from Emergency Power to Normal

CTTS ensures a seamless transition from emergency to normal power sources without interruption, using overlapping contacts to maintain continuous power supply



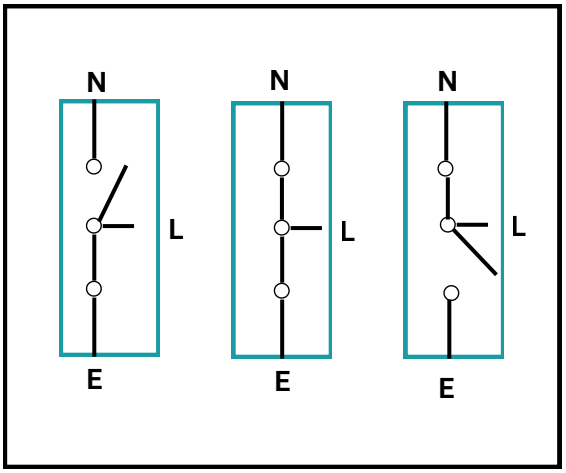
Closed Transition Transfer Switch (CTTS) Uninterrupted Power Supply from Normal to Emergency

Transition from the normal power source to the emergency power source. The transition is overlapped, allowing for an uninterrupted power supply.



Closed Transition Transfer Switch Function (CTTS)

Switch's ability to maintain an uninterrupted power flow through overlapping the disconnection and connection sequences, ensuring no break in power during transitions.



Dimensions

PTS-WN3 Open Transition Non-Bypass

ATS Type	WN3				WN3 in Enclosure		
Rating	No of Poles	WIDTH (mm)	HEIGHT (mm)	DEPTH (mm)	WIDTH (mm)	HEIGHT (mm)	DEPTH (mm)
32-63	2P	202	196	112	500	600	350
	3P	224	196	112			
	4P	246	196	112			
80 100 125	2P	218	200	112			
	3P	248	200	112			
	4P	278	200	112			
160 200 250	2P	228	200	112			
	3P	263	200	112			
	4P	298	200	112			
300 400	2P	255	255	132	600	800	350
	3P	300	255	132			
	4P	345	255	132			
500	2P	287	291	132			
	3P	349	291	132			
	4P	410	291	132			
630	2P	308	325	195			
	3P	369	325	195			
	4P	430	325	195			
800	3P	410	395	210	680	1800	680
	4P	475	395	210			
1000 1250	3P	455	395	250			
	4P	535	395	250			
1600	3P	515	395	255	800	1800	680
	4P	615	395	255			
2000 2600	3P	685	485	280	1000	1800	800
	4P	855	485	280			
3200 4000 5000	3P/4P	1100	565	304	1250	2075	1000
6300		1170	585	337	1600	2075	1200

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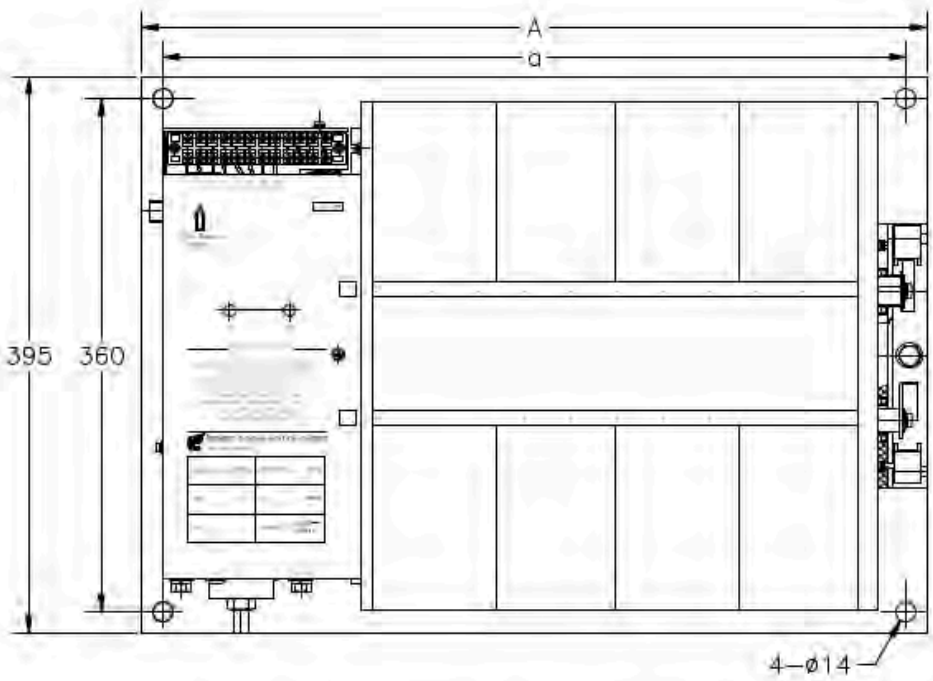
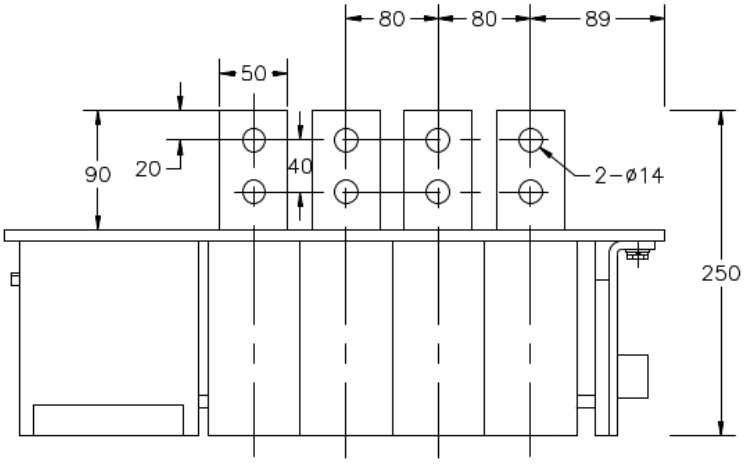
Dimensions

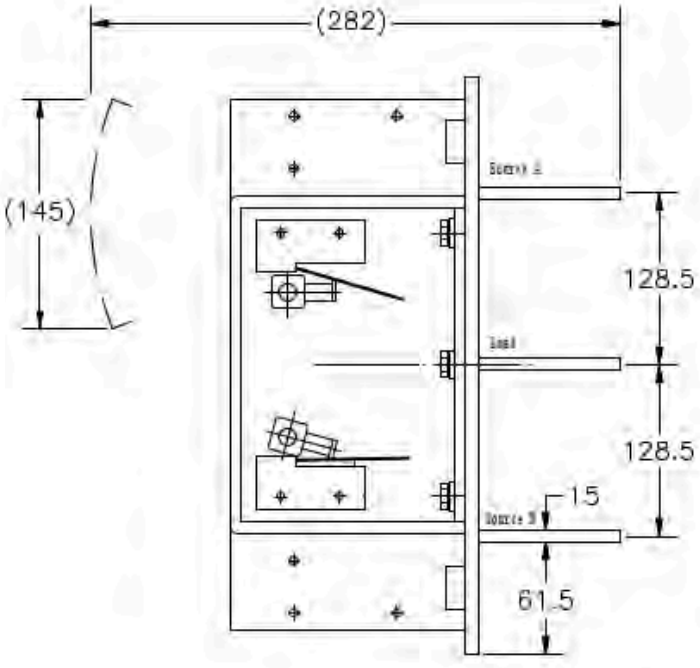
PTS-WN3 Opened Transition Non-Bypass (1250A)



FRONT VIEW



BOTTOM VIEW



SIDE VIEW

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Dimensions

PTS-WN3CT Closed Transition Non-Bypass & PTS-WN3MCT Manual Closed Transition Non-Bypass

ATS Type	WN3CT/WN3MCT				WN3CT/WN3MCT in Enclosure		
Rating	No of Poles	WIDTH (mm)	HEIGHT (mm)	DEPTH (mm)	WIDTH (mm)	HEIGHT (mm)	DEPTH (mm)
63	2P	296	196	135	500	600	350
	3P	318	196	135			
	4P	340	196	135			
80 100 125	2P	312	196	135			
	3P	342	196	135			
	4P	372	196	135			
160 200 250	2P	322	196	135			
	3P	357	196	135			
	4P	392	196	135			
300 400	2P	342	260	135	600	800	350
	3P	387	260	135			
	4P	432	260	135			
500 630	3P/4P	550	320	180	800	1000	400
800 1000 1250	3P/4P	644	394	280	800	1800	680
1600	3P/4P	724	394	280	1250	2075	1000
2000 2600	3P/4P	946	502	286			
3200 4000 5000	3P/4P	1200	565	304	1350	2075	1000
6300	3P/4P	1470	802	390	1600	2075	1200

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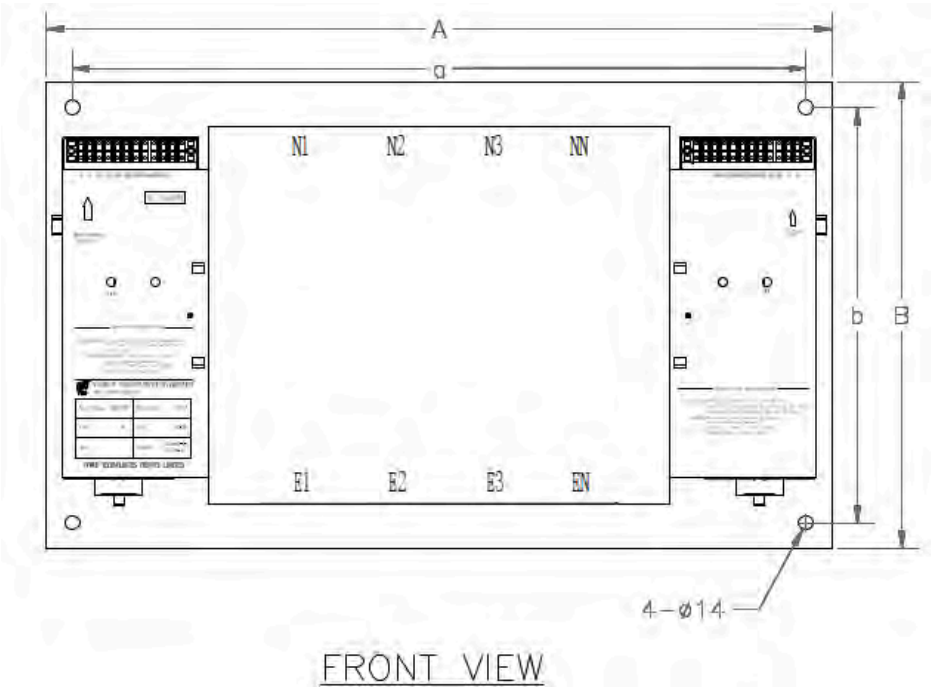
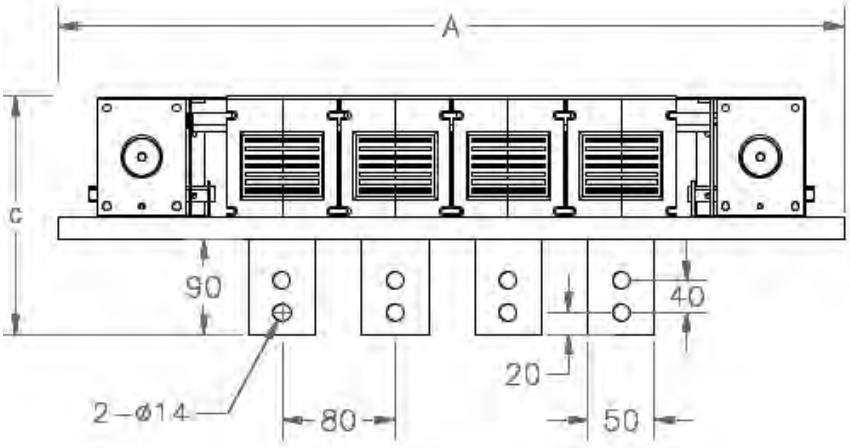
Dimensions

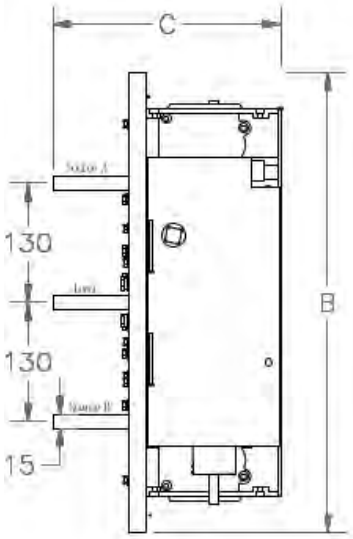
PTS-WN3CT Closed Transition Non-Bypass (1250A)



FRONT VIEW



BOTTOM VIEW



SIDE VIEW

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Dimensions

PTS-WN3B Opened Transition with Bypass & PTS-WNBCT Closed Transition with Bypass

ATS Type	WN3B			WN3BCT			WN3B/WN3BCT in Enclosure		
Rating (A)	WIDTH (mm)	HEIGHT (mm)	DEPTH (mm)	WIDTH (mm)	HEIGHT (mm)	DEPTH (mm)	WIDTH (mm)	HEIGHT (mm)	DEPTH (mm)
125 160 250 300 400 500	500	1050	745	500	1050	745	1000	1800	1200
800	625	1450	891	625	1450	891			
1000 1250 1600 2000	1050	1618	951	1050	1898	951	1200	2200	1500
2600 3000 3200	1250	1618	951	1250	1898	951	1700	2200	1500
4000 5000	1500	1618	951	1500	1898	951			
6300	1780	1621	951	1780	1898	951	2000	2200	1500

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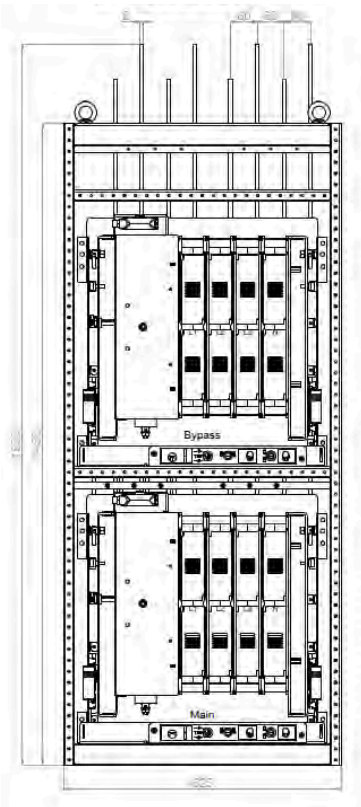
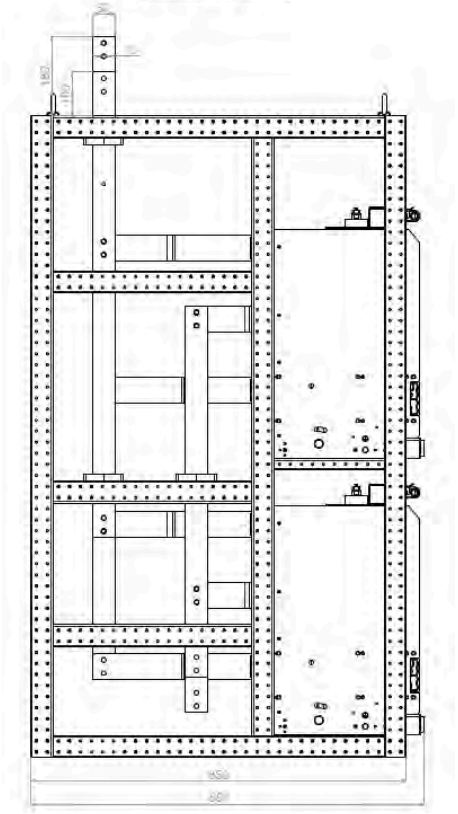


FRONT VIEW



SIDE VIEW

PTS WS1 Series

PTS-WS1 high speed dual-power series double throw transfer switches are PC-level two stage transfer switches design to meet stringent transfer time requirements. With a transfer time of only 8-30msec, the series are appropriate for use the active and standby power share the similar voltage and phases.

This series is particularly well-suited for applications where the active and standby power sources share similar voltage levels and phases. The advanced two-stage design enhances reliability and ensures seamless power transitions, reducing the risk of system downtime or operational instability.

PTS-WS1 100A Series Power Transfer Switch 100A, 4P

General Features

- Transfer Model : ATSE : Class : PC
- Utilization Category : AC-33A / AC-33B
- Rated up to 400/690 VAC
- Sizes from 63 through 630 amperes

Certifications

- Certified to IECEE & CCC GB/T 14048.11-2008 & EN/IEC 6094-7-6-1:2005+A1:2014 standards.
- Automatic Transfer Switching Equipment (ATSE) for reliable power management.
- Designed for emergency and standby power applications.
- Available with break-before-make (open transition) transfer configuration.

Flexible Operation and Control

- PTS-WS1 Series with 2-position configuration in open transitions.
- Manual and automatic switching with synchronized close operations.
- Mechanical interlocked contact mechanism for secure operation.
- Electrically operated, mechanically held, and double-throw type.

Durable and Reliable Design

- Timer and voltage/frequency settings are adjustable without power disconnection.
- Self-cleaning main contact to ensure consistent performance.
- Non-fire fiberglass-reinforced construction for enhanced safety.
- Processor and digital circuitry are isolated from line voltage.

Communication and Monitoring Capabilities

- Opto-isolated input for high immunity to electrical transients and noise.
- Four auxiliary contacts for status monitoring in normal and emergency positions.
- Local and remote serial communication options with PTS-WST products.
- Integrated communications network interface for seamless connectivity.

PTS WS1 High Speed Dual Power Transfer Switches

Dimensions for PTS-WS1 Opened Transition

ATS Type	WS1				WS1 in Enclosure		
Rating	No of Poles	WIDTH (mm)	HEIGHT (mm)	DEPTH (mm)	WIDTH (mm)	HEIGHT (mm)	DEPTH (mm)
63	2P	198	307	119	500	600	250
	3P	220	307	119			
	4P	242	307	119			
125	2P	217	307	119			
	3P	247	307	119			
	4P	277	307	119			
160 250	2P	227	307	119			
	3P	262	307	119			
300 400	2P	232	281	132	500	800	300
	3P	278	281	132			
	4P	323	281	132			
500 630	2P	276	332	150			
	3P	336	332	150			
	4P	396	332	150			

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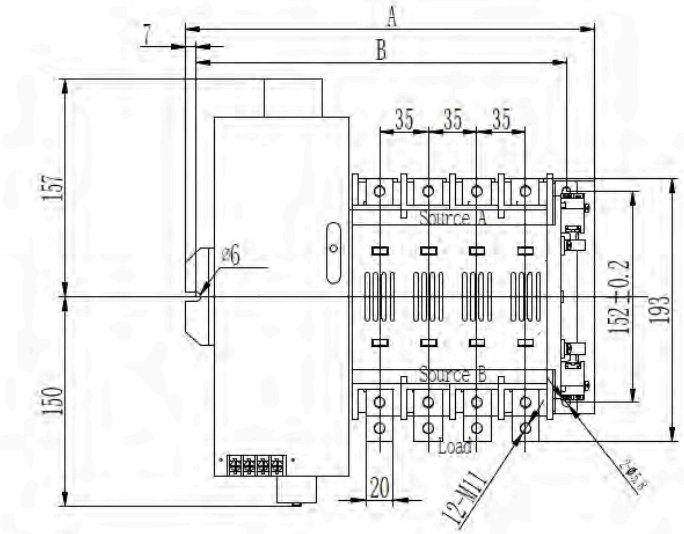
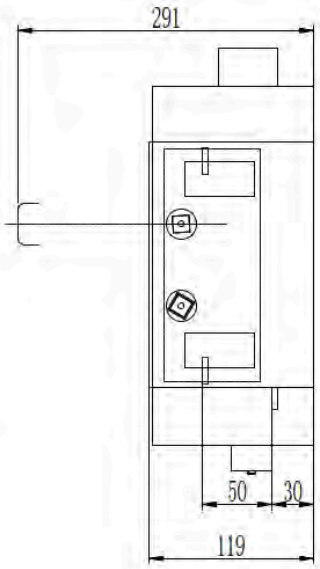


FRONT VIEW



SIDE VIEW

PTS W3S Series Three-Power Automatic Transfer Switch

The PTS-W3S Series represents the cutting-edge in automatic transfer switch (ATS) technology, designed to meet the demanding requirements of critical infrastructure applications.

Key Features and Benefits

1) Design and Versatility

- Power Solenoid-type construction with heavy-duty silver alloy contacts
- Compact, user-friendly design with advanced circuitry and simplified wiring.
- Available in open-type configurations for switchboard integration or enclosed (IEC/NEMA-rated) per customer specifications.

2) High Performance and Reliability

- Quick Operation: Solenoid drive ensures contact transfer within 200 ms or less.
- Manual Operation: Easy-to-operate manual handle for emergencies or maintenance.
- Secure Operation: Fully enclosed arc covers to shield components and prevent exposure during manual use.

3) Advanced Microprocessor Controller

- Intelligent tri-supply control with precision voltage measurement.
- Automatic fault detection for over/under voltage, frequency, loss of phase, and phase sequence errors.
- LCD display with event logging (up to 100 historical records) and real-time monitoring.
- Built-in RS485 communication interface with Modbus-RTU protocol for remote control and monitoring.

4**) Robust Electrical Ratings**

- Rated currents from 32A to 630A.
- Voltage operation: AC 400V, 50Hz, 60Hz with insulation voltage rated at AC 1000V.
- Rated short-circuit capacity: 200kA.

5) **Space Optimization**

- Compact footprint suitable for standard cabinets, minimizing space requirements

Operating Methodology

- **Source 1 Failure:** Upon detecting voltage dip (below 80% of nominal), the system starts the backup generator.
- **Transition to Source 2 or Source 3:** When alternate sources reach 90% rated voltage and 95% frequency, the ATS transitions seamlessly.
- **Resumption to Source 1:** Automatically switches back to Source 1 when voltage stabilizes at 90% nominal.

Technical Specifications

- **Control Circuit:** AC 220V, 50Hz, 60Hz, operating within 85%-110% of nominal voltage**.**
- **Switching Time:** Contact switching <80ms, conversion <200ms.
- **Enclosure Ratings:** IP10, IP54, or IP55 (NEMA 1/3/4).
- **Utilization Categories:** AC-33iA for motor load applications.

Models and Ratings

- **Available Models:** PTS-W3S 125A, 400A, 630A.
- **Rated Operating Current (Ie):** Ranges from 32A to 630A.
- **Poles:** 4P configuration.

PTS W3S Series Three-Power Automatic Transfer Switch

Dimensions for PTS-W3S Series

ATS Type		W3S			W3S in Enclosure		
Rating	No. of P	WIDTH (mm)	HEIGHT (mm)	DEPTH (mm)	WIDTH (mm)	HEIGHT (mm)	DEPTH (mm)
125	2P	227	365	144	500	600	250
	3P	257	365	144			
	4P	287	365	144			
250 300 400	2P	257	426	146	600	800	350
	3P	302	426	146			
	4P	347	426	146			
500 630	2P	303	521	156			
	3P	364	521	156			
	4P	426	521	156			

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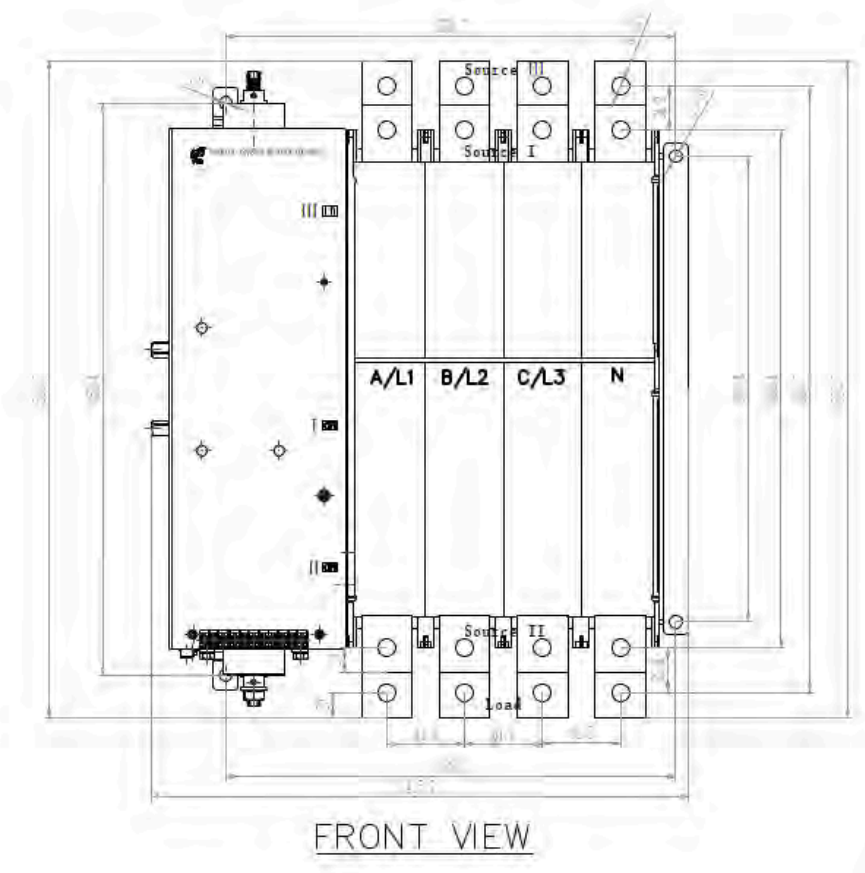
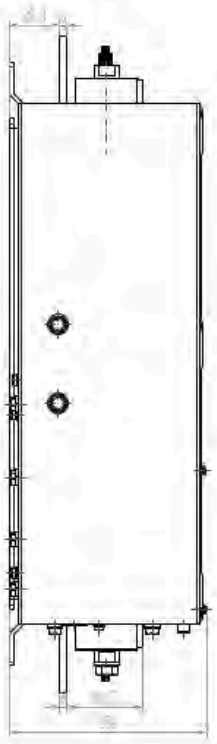


FRONT VIEW



SIDE VIEW

PTS WST Series Microprocessor Controller

Key Features

Real-Time Data Collection:

- Monitors single or three-phase power information from engine generators, utility sources, paralleling switchgear, and automatic transfer switches (ATS).
- Integrated with Power Technologies CLOUD for remote monitoring and asset control.

Compatibility with Transfer Switches:

- Suitable for Double Throw Transfer Switches ranging from 32 to 6300 amperes.
- Supports configurations such as utility-to-utility, utility-to-generator, and generator-to-generator setups.

Advanced Digital Control Functions:

- Provides essential voltage, frequency, control, timing, and diagnostic functionalities.
- Accurate capture and display of parameters like two-way three-phase voltage, frequency, and load current.
- Protection features include overvoltage, under-voltage, open phase, inverse phase sequence, and under-frequency safeguards.

System Control and Operation

Control Options:

- Auto/Manual Switching: Offers flexibility with an easy-to-use interface, allowing users to switch between manual and automatic modes.
- User Commands: Combined key commands ensure safe operation by authorized personnel only.

Manual Operation Capabilities:

- In manual mode, users can force the ATS switch:
- A Power ON or B Power ON for a specific power supply.
- OFF position to disconnect.

Programmed Parameters: On-site programmability of all parameters for custom settings.

Communication and Remote Capabilities

RS-485 Isolated Communication Interface:

- Standard protocol for remote control, signaling, and metering.
- Allows for remote control of generator set start/stop and ATS power state (ON/OFF)

Pluggable I/O Terminal Block:

- Facilitates reliable connections, contributing to ease of installation and maintenance.

Safety and Protection

Built-in Protections:

- ATS current overload protection using a current transformer.
- Includes automatic ON & reset, as well as auto ON & no reset features.

Applicable for Various ATS Switch Configurations:

- Supports single, double, and non-breaking position switches.

In-phase protection:

- Supports large motor transfer high inrush current live to live transfer.

Synchronization protection:

- Synchronous switchover function for mixed load, inductive load, lighting, sensitive equipment and large motor transfer.

User Interface

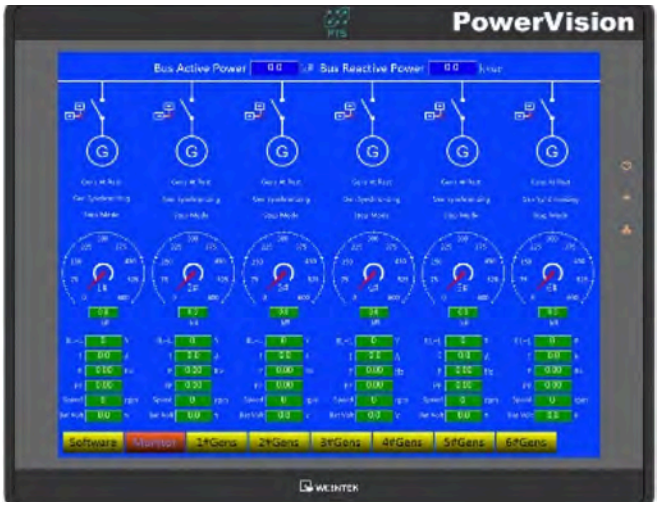
LCD Display:

- Available in English or Chinese, with an intuitive man-machine interface.
- Equipped with buttons for ease of learning and operation.

Modular and Compact Design:

- Constructed with a flame-retardant ABS casing and modular structure.
- Designed for embedded installation, ensuring compactness and ease of maintenance

PTS PowerVision ATS HMI: Advanced Control and Monitoring Solution



The PTS PowerVision ATS HMI is engineered for comprehensive management of single or multiple ATS controllers. This module facilitates real-time monitoring and control, enhancing the functionality and oversight of ATS systems.

Functional Capabilities:

Remote Monitoring Capacity: Supports monitoring from one up to 32 PTS-WST controllers, facilitating centralized oversight.

Interactive Interface: Equipped with a high-resolution LCD and touchscreen interface for straightforward operation and clear data presentation.

Communication Functions: Implements remote control, measurement, and communication, enabling detailed and expansive system management.

Microprocessor Technology: Utilizes a high-end ARM microprocessor for seamless communication with PTS-WST ATS controllers through RS485, ensuring accurate data retrieval and display.

Security and Operation Controls:

Access Control: Configurable operation authorities with password protection to safeguard against unauthorized adjustments, thereby maintaining system integrity and preventing operational disruptions.

System Specifications:

Structural Design: Aluminum casing with a compact, modular design for straightforward installation and durability. The front panel complies with NEMA4/IP65 standards, ensuring protection against environmental factors.

Environmental Adaptability: Operates effectively within a temperature range of -20° to +50°C and relative humidity of 10% to 90% non-condensing, demonstrating reliability under variable climatic conditions.

Technical Parameters:

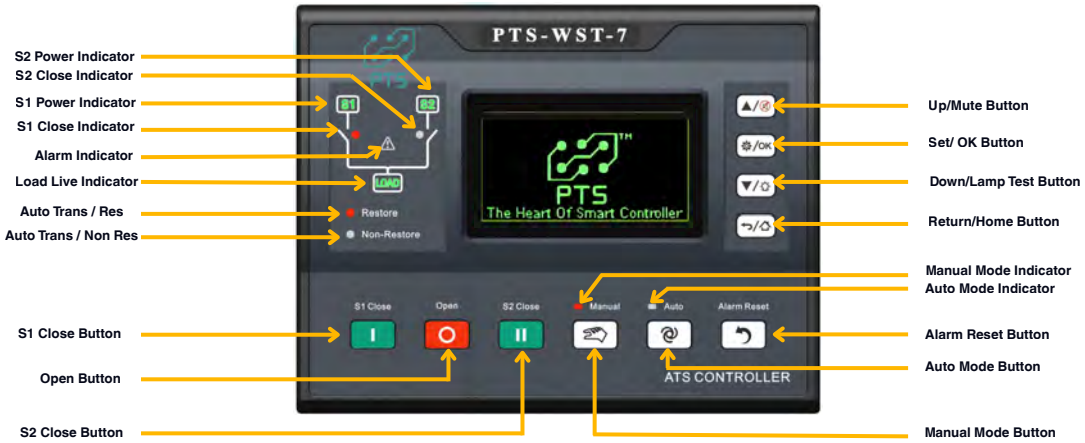
Power Requirements: DC 24VDC ±20% with a power consumption of 1.0A at 24VDC.

Connectivity Options: Includes SD/SDHC card slot, two USB ports, and an RJ45, alongside multiple COM ports (RS-232/RS485 2W/4W; RS 485 2W) for enhanced connectivity.

Memory and Processing: Equipped with 128 MB Flash and 256 MB RAM for efficient data processing and storage.

PTS-WST-7 Microprocessor Controller

The WST-7 Dual Power ATS Controller is an advanced microprocessor-based solution designed for seamless power management across dual power supply systems. It is tailored for applications requiring precise voltage monitoring, efficient transfer capabilities, and intelligent control in diverse settings such as data centers, telecommunications, industrial facilities, and intelligent buildings.



Key Features

- **Quick Power Transfer:** Response time as low as 50 ms.
- **Operation Modes:** Manual and automatic transfer capabilities.
- **Advanced Monitoring:** Voltage, frequency, phase sequence, power factors, and harmonic analysis.
- **High Compatibility:** Supports PC, CB, and CC class switches for Mains-Mains, Mains-Gen, and Gen-Gen setups.
- **LCD Interface:** 132x64 pixel backlit LCD with multilingual support.
- **Safety Features:** Over/under voltage, frequency monitoring, and loss/reverse phase detection.
- **Energy Efficiency:** Load voltage monitoring and scheduled generator operations.
- **Event Logging:** Records up to 200 events and includes a black box feature.

Special Features

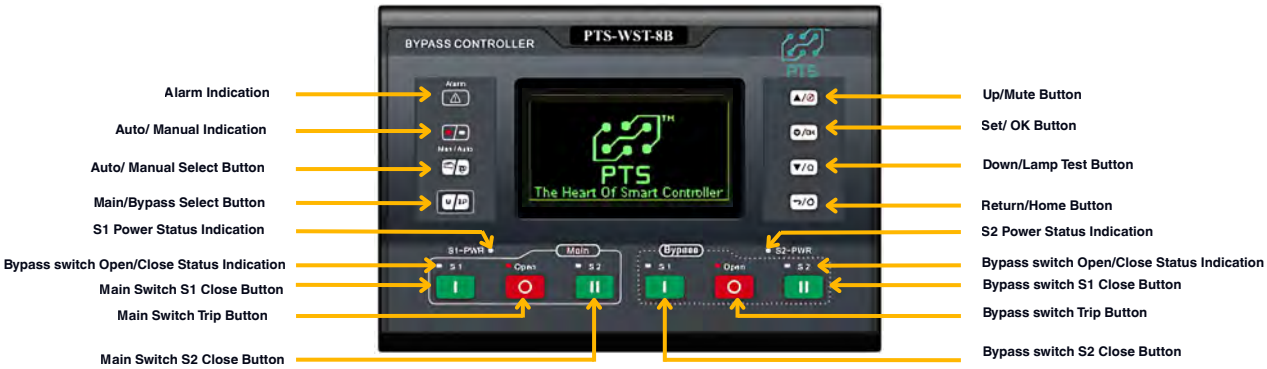
- **Switch Functions:**
  - Manual and automatic switching with in-phase monitoring for large motor transfer
  - Phase difference, frequency, and voltage thresholds for safe operation.
  - Scheduled Operations: Set monthly, weekly, or daily generator runs with custom duration settings.
- **Black Box Functionality:** Records detailed pre- and post-event data for fault analysis.

Technical Specifications

- **Operating Voltage:** DC (12–30V) with reverse protection; AC (90–305V).
- **Power Consumption:** <4W in standby mode.
- **Frequency Range:** 15Hz–75Hz with 0.1Hz accuracy.
- **Communication Ports:** USB, RS485 (Modbus-RTU), and Ethernet (Modbus TCP/IP).
- **Environmental Conditions:** Operating Temp: -25°C to +70°C; Protection: IP65 (front), IP20 (back).
- **Dimensions & Weight:** 198mm x 154mm x 54mm; 0.8kg

PTS-WST-8B Series Dual Power Bypass Microprocessor Controller

The WST-8B Intelligent Dual Power Bypass Switch Module is a compact, network-enabled device with programmable functions, automatic measurement, LCD display, and a passive synchronizer to prevent inrush current, ideal for reliable dual power bypass applications.



Core Components and Capabilities

- **Micro-Processor:** Detects 2-way 3-phase power, identifies abnormalities, and sends control signals
- **System Type Configurations:** Configurable for various types (e.g. S1 Mains S2 Mains, S1 Mains S2 Gen, etc.)
- **LCD Display:** 4.3'' 240x128 display, white backlit, multilingual, push-button

Measurement & Display

- **Voltage, Frequency, and Phase Sequence:** Monitors and displays 2-way, 3-phase information
- **Load Power Parameters:** Displays active, reactive, apparent power, power factor, and current
- **Switch Position:** Shows position of main switch and bypass switch (working, testing, insulated)
- **Energy & Power Supply Tracking:** Tracks energy, switch closes, supply duration, and total runtime.
- **Synchronization & Difference Display:** Voltage, frequency, and phase differences for synchronous switchover function for mixed load, inductive load, lighting, sensitive equipment and large motor transfer.
- **In-phase Angle Display:** In-phase monitoring to prevent inrush current for large motor transfer

Control and Protection Functions

- **Automatic/Manual Mode Switchover:** Enables manual close/open control
- **Protection Features:** Protects against over/under voltage, over/under frequency, overcurrent, loss of phase, inverse phase sequence
- **Dual RS485 Communication Interface:** Remote capabilities (control, measure, communicate, regulate) via ModBus-RTU
- **Real-time Clock & Event Logging:** Records 200 events, black box function with event data before and after
- **Scheduled Start/Stop for Genset:** Configurable daily/weekly/monthly starts, with or without load

Additional Functionalities

- **Genset Testing:** Manual testing available for start/stop operation on site
- **Wide DC Power Supply Range:** Can handle instantaneous 80V DC input
- **Large Terminal Space:** Supports up to 625VAC voltage input
- **Modular Design & Easy Installation:** Flame-retardant ABS plastic, pluggable terminals, compact structure

PTS-WST-9 Microprocessor Controller

The WST-9 ATS controller integrating programmable function, automatic measurement, LCD display, and digital communication. Includes features like digitalization, intelligence, and network capabilities to automate measurement and control, reducing human errors.

Features

- **Display:** 240x128 LCD with backlight, multilingual support (e.g., English, Chinese), touch-button interface.
- **Design:** Compact, modular, IP65-rated with flame-retardant plastic casing and pluggable terminals. Built for easy installation.
- **Operation Modes:** Supports Automatic and Manual modes; Manual mode allows force-close or open of the switch.
- **User Interaction:** Interactive setup and configuration through soft keys and display; guides user through settings, alarms, metering, and logging.
- **Alarm & Event Logging:** Includes alarm acknowledgment, trip alarms, and event logging with a capacity of up to 200 entries.

Metering & Monitoring

- **Real-time Metering:** Measures voltage (phase-to-phase, phase-to-neutral) and frequency as standard; optional current, power, and historical trending metering.
- **Advanced Protection:** Features Synchronizer & in-phase monitoring to prevent inrush current; offers over/under voltage, phase loss, reverse phase, frequency, and phase sequence protection.
- **Performance Monitoring:** Displays continuous and cumulative power supply times for S1/S2 sources; includes real-time clock (RTC) with event logging.

Generator Management

- **Modes:** Includes Cycle Run mode, Master Run mode, and Balance Run mode for managing two generators efficiently.

Connectivity & Remote Access

- **Communication Ports:** Two RS485 isolated communication ports with ModBus-RTU protocol, enabling remote control, measuring, and communication.
- **Remote Operation:** Supports remote start/stop of genset and remote control of ATS open/close functions.

Technical Specifications

- **Power Supply Range:** Wide DC range (8–35V), capable of withstanding 80V instantaneous current.
- **Terminal Capacity:** Large terminal space allowing up to 625V input voltage.

Additional Features

- **Reclosing & Signal Output:** Automatic reclosing function with customizable signal output intervals or continuous output.
- **Password Authentication:** Password protection ensures only authorized personnel can perform specific operations.

System Compatibility

- **Supported Configurations:** Compatible configurations include: - S1 (Mains) & S2 (Mains) - S1 (Mains) & S2 (Generator) - S1 (Generator) & S2 (Mains) - S1 (Generator) & S2 (Generator)
- **AC System Types:** Supports various AC systems: - 3-phase 4-wires - 3-phase 3-wires - Single-phase 2-wire - 2-phase 3-wire

Optional Features

Permanent Predictive 7 x 24 x 365 Self-Powered Thermal Monitoring Systems

The PT Energy Harvesting Self-Powered Sensor system offers continuous 24/7 predictive thermal monitoring, pinpointing potential issues before failure occurs by utilizing EH sensors installed in critical areas. This versatile and innovative solution can also be integrated with ATS systems, ensuring comprehensive thermal management.

- Permanent 7 x 24 Thermal Monitoring System utilizing IP68
- Energy harvesting (EH)
- No battery
- Self-powered
- Flame retardant plastic,with 20-years in-service life with maintenance-free.
- Maintenance and calibration free for lifetime.

PTSPS061 EH Temperature Sensor

PTSPS068 Temperature & Humidity Sensor

Advantages

Real-Time Monitoring

- Provides continuous, real-time temperature monitoring for critical electrical components/joints/connection
- Enables proactive detection of temperature anomalies to prevent failures.

Wireless Connectivity

- Eliminates the need for complex wiring, reducing installation time and cost.
- Ensures easy integration into existing systems with minimal disruption.

Industry Compliance

- Meets international standards, ensuring high reliability and durability.
- Designed for long-term operation in demanding environments.

Easy Scalability

- Can be easily scaled to monitor multiple points in a system.
- Ideal for expanding monitoring networks in large industrial setups.

Improved ROI

- Delivers optimized performance and reduced operating costs.
- Increases return on investment by improving uptime and minimizing risks.

Versatile Applications

- Suitable for MV/HV switchgear, transformers, ups renewable energy systems, and more.

Enterprise Cloud Service Monitoring Platform

Power Technologies™ Real-Time Measurement, Monitoring, & Control

Power Technologies™ cutting-edge solution for real-time ATS and Genset measurement, monitoring, and control enables seamless remote asset management. View ATS status, Genset status, event logs, and more—all from one centralized platform.

Performance & Features

Remote Management:

Access and manage assets via apps and webpages.

Real-Time Status Updates:

View real-time ATS and Genset status, parameters, and history.

Detailed Event Logs:

Get quick insights into past events and system logs for accurate troubleshooting.

Location Tracking:

Instantly see the real location of ATS and Genset.

Convenient Control:

Remotely manage assets to optimize operations and reduce on-site visits.

Production Uptime and Risk Mitigation:

Reduces downtime by enabling faster issue resolution.
Mitigates risks such as overheating, power surges, and component failures.

Applications:

Industrial Plants: Monitor heavy machinery, transformers, and switchgear.
Commercial Facilities: Manage energy consumption in malls, office buildings, and hospitals.
Utilities and Smart Grids: Ensure reliability and efficiency in power distribution networks.
Renewable Energy Systems: Optimize solar farms, wind turbines, and battery storage.
Critical Infrastructure: Enhance monitoring in data centers, airports, and defense facilities.

Conditions for Normal Installation and Operation

1. Ambient Temperature

- Operating Range: -5°C to +40°C
- 24-Hour Average: Max. +35°C
- Storage: −30 °C to +80 °C (−22 °F to +176 °F)

2. Elevation

- Installation Altitude: ≤ 2000m

3. Atmospheric Conditions

- Relative Humidity: ≤ 50% at 40°C; may vary at lower temperatures
- Minimum Monthly Temperature: ≥ -25°C
- Maximum Monthly Relative Humidity: ≤ 90%

Note: Protect equipment from dew condensation due to temperature changes

4. Pollution Level

- Conforms to: Level 3 (GB/T14048.1 , IEC 60947-1)
- **Dust:** For dusty settings, it's recommended to install the transfer switch in clean, dry rooms with air filtration or pressurized systems. Additional filters or gaskets are available for ventilated enclosures.
- **Moisture:** In moist environments, consider a thermostat-controlled heater to prevent condensation, with stainless steel enclosures available for extra protection.
- **High Altitude:** Above 2000 meters, adjust voltage and current ratings according to ANSI C37.20.1 derating factors to maintain reliable operation.

5. Installation Energy Compliance

- Switch Equipment: Category III (IEC 60947-1)
- Transfer Controller: Category II (IEC 60947-1)

6. Installation Options

- Mounting: Horizontal or vertical placement in control or distribution cabinets

7. Use Category

Main Circuit	AC-33A (FREQUENT OPERATION)	AC-33B (INFREQUENT OPERATION)	Motor Load/Resistive Load ≤30%
Auxiliary circuit and transfer controller	AC -15		Load of controlling alternating electromagnet
	DC-13		Load of controlling electromagnet

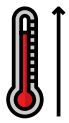
8. Control Circuit

- Voltage: 220V/230V/50Hz/60Hz
- Control Power: Rated at 85% to 110% Us
- Special Voltage Ranges: -180V (under-voltage) and +250V (over-voltage)

9. Auxiliary Circuit

- Electrical Structure: 4 normally open and 4 normally closed contacts
- Refer to the table for voltage ratings

Conditions for Normal Installation and Operation



When installing the switch avoid high temperatures, steam or harmful gas (exhaust gas) and dust.

>0.5s

To ensure reliable operation, maintain control commands for longer than 0.5 seconds

The switch will stay in the input state when an input command and a tripping command are sent to the same power side simultaneously. Please avoid doing this; otherwise the coils will remain excited.

Apply electric operation and try to avoid manual operation.

Under DC conditions, if the power has a step-down loop (DROPPER), connect the power to the input side of the step-down loop rather than the output side.

Make sure the operating power cables are long enough and pay special attention to the storage battery capacity.

Excitation in the PTS-W series is instantaneous and the operating power is cut off after the input operation ends instead of being cut by the external operating power via auxiliary switch (AUX.SW.).

Please contact the company if you have a need for products with special features and specifications.

Installation

The switches must be installed in the correct orientation because of their structure and mode of operation. Incorrect orientation will result in changes to the switch characteristics. Please ensure the switches are installed correctly. Contact the company if this cannot be done as stipulated for wiring or mechanical reasons. The switches should be installed vertically, parallel with the vertical plane of the switchboard, and with the name plate visible from the front.

Maintenance, Examination and Storage

Note: Examination and maintenance should be carried out by professionals with all the external power cut off.

To maintain performance and a good operating state of the switches, perform the first maintenance within one year of installation. After this, periodical maintenance should be carried out annually. The basic items to be inspected are listed as below.

1. **Keep the switches clean to prevent failure due to dust, dirt, or rust**
2. **Perform a visual inspection of the contact parts for deformation, damage or change in color. Clear off metal deposits and burns on the contact surface and around the contact.**
3. **Poor contact can be the result of rust, oxidation or dust on the contact surface. During maintenance, check connection/disconnection operation (measure the contact resistance if necessary), and fasten any loosen connecting parts.**
4. **Under DC conditions, pay attention to the storage battery capacity and the charging.**
5. **New switches or those unused for a long period should be stored in an environment similar to the operating environment. Measures should be taken to avoid dust, dampness, shock or accident.**
6. **Before using switches that have become damp, or have not been used for some time, remove the dust, dirt and dry them well. Then measure the isolation resistance of every two poles, inlet lines and outlet lines, the main/auxiliary circuit and the installation metal board (box) using a tester.**

Technology

Power Technologies Private Limited (PT) specializes in end-to-end LV and MV switching control gears, providing predictive, non-contact thermal monitoring solutions that bring Industrial IoT, Big Data, and AI capabilities to organizations in need of real-time business insights. In today's digital landscape, power is more than a convenience—it's an essential component for securing business continuity.

Our approach across industries is simple: measure, learn, and act. By collecting data, deriving insights, and supporting action based on those insights, we empower our customers to make informed decisions grounded in high-value business intelligence.

Service

With over 20 years of experience in the power protection industry, PT is well-positioned with state-of-the-art solutions to address today's most critical and demanding power protection requirements and challenges.

We offer a broad portfolio of services, from innovative products to turnkey design and engineering solutions, tailored to meet the specific needs of mission-critical industries. Our commitment to personal service, forward-thinking, and rapid response means that we are ready to meet your needs immediately. Whether complementing existing systems or delivering a comprehensive solution, we aim to meet and exceed customer expectations.

To provide a complete competitive advantage, PT offers end-to-end solutions, ensuring the reliability of power protection systems through the entire lifecycle. Our team handles installation, commissioning, and proactive maintenance to keep systems at peak performance.

Our support services include:

- **Critical systems start-up**
- **Corrective and preventive maintenance**
- **Operator training support**
- **Monitoring solutions**
- **Original factory spare parts and upgrades**

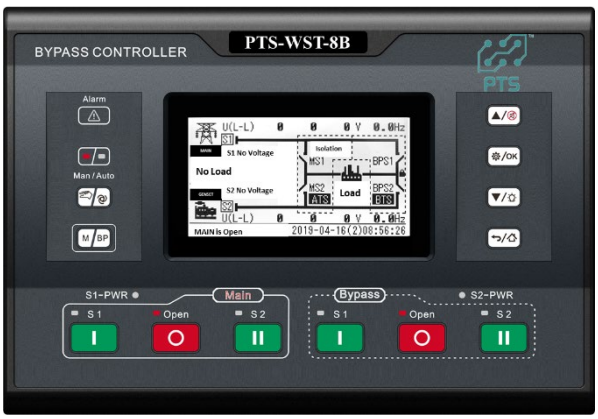
Whenever and wherever you need assistance, we are there!

POWER TECHNOLOGIES™ PRIVATE LIMITED 61 Kaki Bukit Avenue 1, #05-02 Shun Li Industrial Park, Singapore 417943

info@ptsapac.com | www.ptsapac.com

PTS-WST-8B Series Dual Power Bypass ATS Controller is an intelligent dual power bypass switch module which integrates programmable function with automatic measurement, LCD display and digital communication. It is with qualities of digitalization, intelligence, and network. Measurement and control automation are realized for reducing human operation mistakes, so it is the ideal device for dual power bypass switch.

PTS-WST-8B Series Dual Power Bypass ATS Controller is composed of micro-processor, which is the core in the controller, and can precisely detect 2-way 3-phase power, making correct judgment for abnormal power statuses (over voltage, under voltage, loss of phase, over frequency, under frequency) and outputting free voltage control signals. After overall consideration about its bypass switch application, it can be used directly on single and dual bypass switches, and manual or remotecontrol switches. It is with compact structure, advanced circuit, simple wiring, and high reliability, and can be widely used in electrics, telecommunications, petroleum, coal, metallurgy, railway, municipal administration, intelligent building fields, electric installations, servicer power supply and debug system.



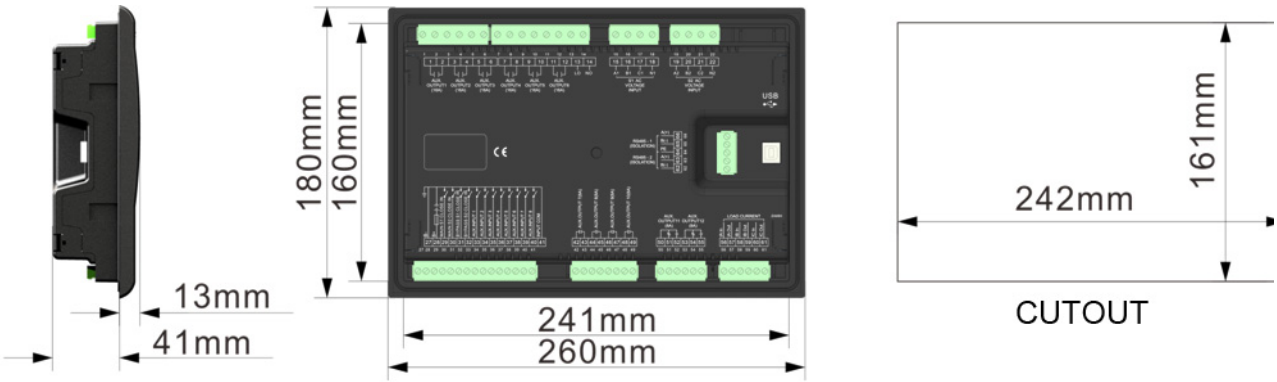
PERFORMANCE AND CHARACTERISTICS

- System type can set as: S1 Mains S2 Mains, S1 Mains S2 Gen, S1 Gen S2 Mains, S1 Gen S2 Gen;
- 4.3 inch's solid color 240x128 pixel LCD display with white backlit, multilingual interface (including English, Simplified Chinese, and other languages), push-button operation;
- Collect and display voltage, frequency, and phase sequence of 2-way 3-phase;
- Collect and display active power, reactive power, apparent power, power factor and current of load;
- Display position of main switch (operation, test, isolate), and position of bypass switch (operation, test, isolate);
- Independent S1/S2 over current warning or trip alarm functions;
- NEL (Non-essential Load) trip function;
- Display S1/S2 total kW energy, total kvar energy;
- Display S1/S2 accumulated close times of main switch and bypass switch;
- Display continuous power supply time at present and last time, and S1/S2 total power supply time;
- Can realize synchronous switchover function, and display voltage difference, frequency difference and phase difference of 2 circuits;
- For energy-accumulated ATS, it shall close when switch PF (close is prepared well) signal is active;
- Over/under voltage, over/under frequency, over current, loss of phase, inverse phase sequence protection functions;
- Automatic/Manual mode switchover; In manual mode, close or open can be controlled manually or handle (normal/emergency);
- All parameters can be set on site. Password validation is applied to prevent wrong operations for non-professionals;
- The genset can be tested manually on site to achieve start/stop operation;
- Re-close function of main switch and bypass switch in auto mode when power outage occurs;
- Applicable for single bypass, double bypass, and alternate dual spare bypass switch;
- Applicable for bypass switch of manual control and remote control;
- 2-way N wire isolated design;
- Real-time clock (RTC); event log function, which can record up to 200 events circularly;
- Black box record function, which can record 5 events circularly, 60 data of 50s before each event record, and 10s after each event record;
- Scheduled routing start & scheduled not start function for the genset, which can be set as start once a day/week/month; and running with load or not, 7 programs;
- Can control two generators to work in the mode of circular running, master running and balanced running;
- Wide DC power supply range, which allows the controller to bear instantaneous 80V DC current input;
- Large terminal space allows the controller to bear maximum 625V AC voltage input;
- Dual isolated RS485 communication interface, having the functions of "remote control, remote measuring, remote communication, remote regulating" by the ModBus-RTU communication protocol, which can remotely start/stop the genset and control the breaker to close or open;
- Suitable for multiples of AC systems (3-phase 4-wire, 3-phase 3-wire, single-phase 2-wire, and 2-phase 3-wire);
- Modular design, flame retardant ABS plastic shell, pluggable terminals, built-in mounting, compact structure, and easy installation.

Performance Parameters

Items	Contents	
Operating Voltage	1. DC8.0V~35.0V, continuous power supply 2. AC (90~305) V power supply A1N1/A2N2	
Power Consumption	<7W (Standby mode: ≤2W)	
AC Voltage Input	AC system	
	3P4W (L-L)	(80~530) V
	3P3W (L-L)	(80~625) V (require DC supply)
	1P2W (L-N)	(50~305) V
	2P3W (A-B)	(80~530) V
	Accuracy: 1%	
Rated Frequency	50/60Hz Accuracy: 0.1Hz .	
AC Current	Accuracy: 2%	
Programmable Output 1~6 Relay Capacity	16A AC250V Volts free output	
Programmable Output 7~12 Relay Capacity	8A AC250V Volts free output	
Digital Input	GND (B-) connected is active.	
Communication	1. Dual-RS485 isolated interface, MODBUS Protocol 2. Form D USB port	
Case Dimensions	260mmx180mmx54mm	
Panel Cutout	242mmx161mm	
Working Conditions	Temperature: (-25~+70)°C; Relative Humidity: (20~95)%RH	
Storage Condition	Temperature: (-30~+80)°C	
Protection Level	IP65: when water proof gasket ring inserted between screen and housing.	
Insulation Strength	Apply AC1.5kV voltage between high voltage terminal and low voltage terminal, and the leakage current is not more than 3mA within 1min.	
Weight	1.2kg	

Installation Dimension



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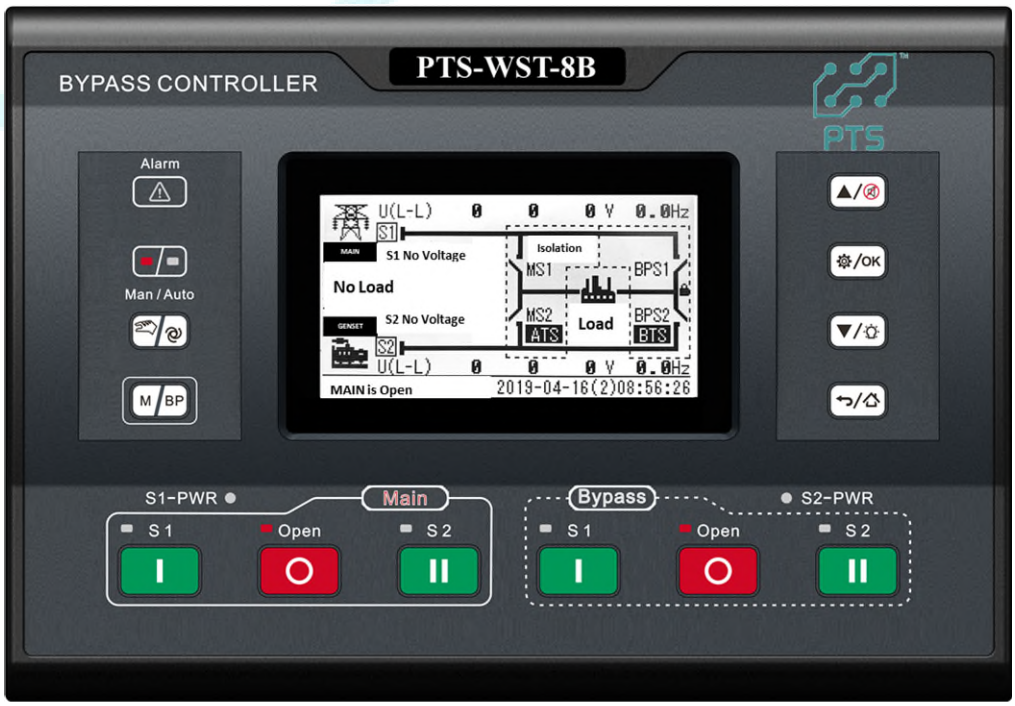
POWER TECHNOLOGIES™
Private Limited

PTS-WST-8B SERIES

(PTS-WST-8B)

DUAL POWER BYPASS ATS CONTROLLER

USER MANUAL



Power Technologies — make your ATS & generator ***smart***

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Email: info@ptsapac.com

Table 1 - Software Version

Date	Version	Note
2019-04-25	1.0	Original release.
2019-07-12	1.1	Add Synchronous switchover function description.

CONTENT

1 OVERVIEW

PTS-WST-8B Series Dual Power Bypass ATS Controller is an intelligent dual power bypass switch module which integrates programmable function with automatic measurement, LCD display and digital communication. It is with qualities of digitalization, intelligence, and network. Measurement and control automation are realized for reducing human operation mistakes, so it is the ideal device for dual power bypass switch.

PTS-WST-8B Series Dual Power Bypass ATS Controller is composed of micro-processor, which is the core in the controller, and can precisely detect 2-way 3-phase power, making correct judgment for abnormal power statuses (over voltage, under voltage, loss of phase, over frequency, under frequency) and outputting free voltage control signals. After overall consideration about its bypass switch application, it can be used directly on single and dual bypass switches, and manual or remote-control switches. It is with compact structure, advanced circuit, simple wiring, and high reliability, and can be widely used in electrics, telecommunications, petroleum, coal, metallurgy, railway, municipal administration, intelligent building fields, electric installations, servicer power supply and debug system.

2 NAME CONVENTION AND MODEL CONTRAST

2.1 NAME CONVENTION

PTS-WST-8B SERIES

Fig. 1 - Name Convention Diagram

2.2 MODEL CONTRAST

Table 2 - Model

FUNCTION							
Model	DC Supply	AC Supply	AC Current and Power	SYNC Close	Input No. (Fixed. + Flex.)	Output No. (Flex.)	RS485
PTS-WST-8	•	• (90~305V)	•		12	12	•
PTS-WST-8B	•	• (90~305V)	•	•	12	12	•

3 PERFORMANCE AND CHARACTERISTICS

——System type can set as: S1 Mains S2 Mains, S1 Mains S2 Gen, S1 Gen S2 Mains, S1 Gen S2 Gen;
——4.3 inch's solid color 240x128 pixel LCD display with white backlit, multilingual interface (including English, Simplified Chinese and other languages), push-button operation;
——Collect and display voltage, frequency and phase sequence of 2-way 3-phase;
——Collect and display active power, reactive power, apparent power, power factor and current of load;
——Display position of main switch (operation, test, isolate), and position of bypass switch (operation, test, isolate);
——Independent S1/S2 over current warning or trip alarm functions;
——NEL (Non-essential Load) trip function;
——Display S1/S2 total kW energy, total kvar energy;
——Display S1/S2 accumulated close times of main switch and bypass switch;
——Display continuous power supply time at present and last time, and S1/S2 total power supply time;
——Can realize synchronous switchover function, and display voltage difference, frequency difference and phase difference of 2 circuits;
——For energy-accumulated ATS, it shall close when switch PF (close is prepared well) signal is active;
——Over/under voltage, over/under frequency, over current, loss of phase, inverse phase sequence protection functions;
——Automatic/Manual mode switchover; In manual mode, close or open can be controlled manually;
——All parameters can be set on site. Password validation is applied to prevent wrong operations for non-professionals;
——The genset can be tested manually on site to achieve start/stop operation;
——Re-close function of main switch and bypass switch in auto mode when power outage occurs;
——Applicable for single bypass, double bypass and alternate dual spare bypass switch;
——Applicable for bypass switch of manual control and remote control
——2-way N wire isolated design;
——Real-time clock (RTC); event log function, which can record up to 200 events circularly;
——Black box record function, which can record 5 events circularly, 60 data of 50s before each event record, and 10s after each event record;
——Scheduled routing start & scheduled not start function for the genset, which can be set as start once a day/week/month; and running with load or not;
——Can control two generators to work in the mode of circular running, master running and balanced running;
——Wide DC power supply range, which allows the controller to bear instantaneous 80V DC current input;
——Large terminal space allows the controller to bear maximum 625V AC voltage input;
——Dual isolated RS485 communication interface, having the functions of "remote control, remote measuring, remote communication, remote regulating" by the ModBus-RTU communication protocol, which can remotely start/stop the genset and control the breaker to

close or open;

——Suitable for multiples of AC systems (3-phase 4-wire, 3-phase 3-wire, single-phase 2-wire, and 2-phase 3-wire);

——Modular design, flame retardant ABS plastic shell, pluggable terminals, built-in mounting, compact structure, and easy installation.

4 SPECIFICATION

Table 3 - Performance Parameters

Items	Contents	
Operating Voltage	1. DC8.0V~35.0V, continuous power supply 2. AC (90~305) V power supply A1N1/A2N2	
Power Consumption	<7W (Standby mode: ≤2W)	
AC Voltage Input	AC system	
	3P4W (L-L)	(80~530) V
	3P3W (L-L)	(80~625) V DC supply
	1P2W (L-N)	(50~305) V
	2P3W (A-B)	(80~530) V
Rated Frequency	50/60Hz	
Programmable Output 1~6 Relay Capacity	16A AC250V Volts free output	
Programmable Output 7~12 Relay Capacity	8A AC250V Volts free output	
Digital Input	GND (B-) connected is active.	
Communication	1. Dual-RS485 isolated interface, MODBUS Protocol 2. Form D USB port	
Case Dimensions	260mmx180mmx54mm	
Panel Cutout	242mmx161mm	
Working Conditions	Temperature: (-25~+70)°C; Relative Humidity: (20~95)%RH	
Storage Condition	Temperature: (-30~+80)°C	
Protection Level	IP65: when water proof gasket ring inserted between screen and housing.	
Insulation Strength	Apply AC1.5kV voltage between high voltage terminal and low voltage terminal, and the leakage current is not more than 3mA within 1min.	
Weight	1.2kg	

5 MEASURE AND DISPLAY DATA

Table 4 - Display Parameters

No.	Measure & Display Data Items
1	S1/S2 Power Phase Voltage
2	S1/S2 Power Line Voltage
3	S1/S2 Power Voltage Phase
4	S1/S2 Power Frequency
5	Load 3-Phase Current
6	Load 3-Phase Active Power kW
7	Load Total Active Power kW
8	Load 3-Phase Reactive Power kvar
9	Load Total Reactive Power kvar
10	Load 3-Phase Apparent Power kVA
11	Load Total Apparent Power kVA
12	Load 3-Phase Power Factor PF
13	Load Average Power Factor PF
14	Continuous Power Supply Time (Currently)
15	Continuous Power Supply Time (Last Time)
16	S1 Total Power Supply Time
17	S2 Total Power Supply Time
18	S1 Total kW Energy kWh
19	S2 Total kW Energy kWh
20	S1 Total kvar Energy kvarh
21	S2 Total kvar Energy kvarh
22	MS1 Total Close Times
23	MS2 Total Close Times
24	BPS1 Total Close Times
25	BPS2 Total Close Times
26	Digital Input/output Port Status
27	Real Time Clock
28	Historical Records
29	Black Box Records
30	Communication Status
31	Sync. information (PTS-WST-8B)

6 OPERATION

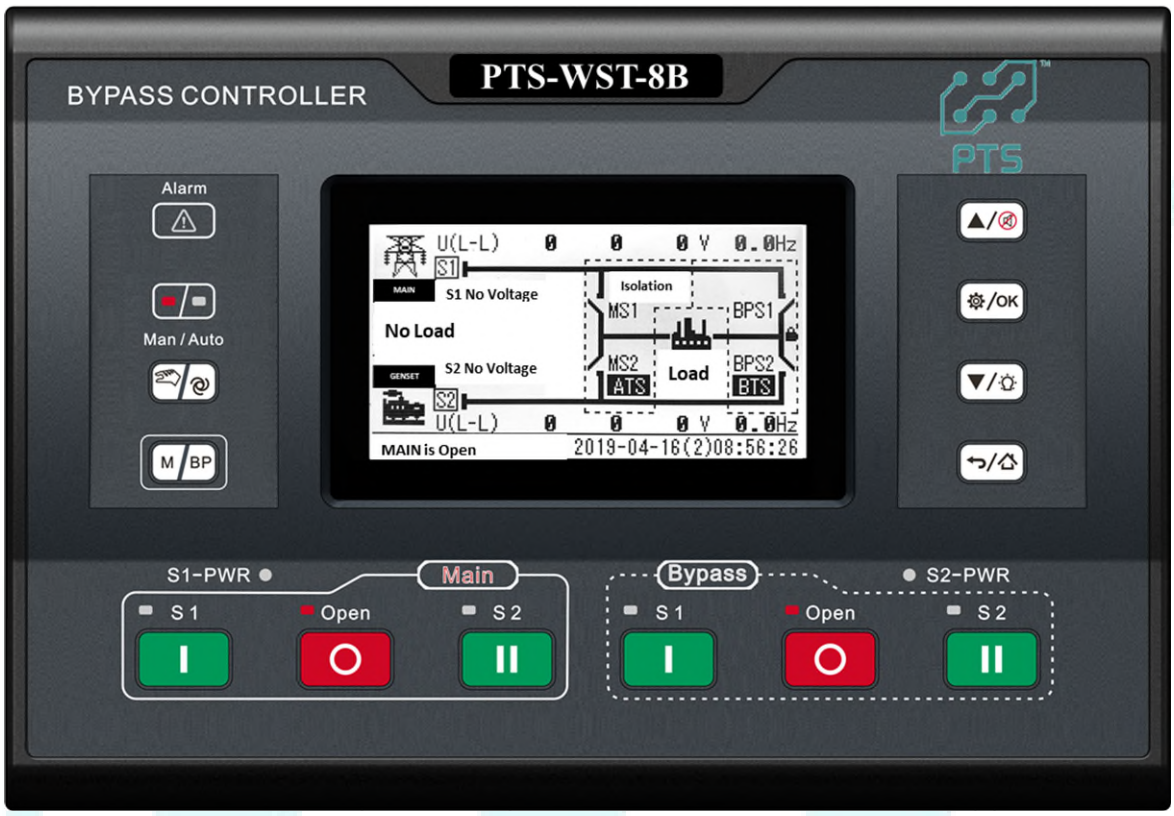


Fig. 2 - Contoller Indication Diagram

6.1 INDICATORS

Table 5 - Indicators Description

Indicator Type	Description
Alarm	Slow flashing (1 time per sec) when warning alarm occurs. Fast flashing (5 times per sec) when fault alarm occurs.
Man	Light on when the module is in Manual mode.
Auto	Light on when the module is in Auto mode.
S1-PWR	S1 power indicator: always illuminated when S1 is normal; slow flashing (1 time per sec) when voltage is abnormal; extinguished when S1 is no power.
S2-PWR	S2 power indicator: always illuminated when S2 is normal; slow flashing (1 time per sec) when voltage is abnormal; extinguished when S2 is no power.
Main	When main switch is unlocked, main indicator is always illuminated.
Bypass	When bypass switch is unlocked, bypass indicator is always illuminated.
Main S1	Always illuminated: Main S1 closes, load is supplied by S1.
Main Open	Always illuminated: Main is open.
Main S2	Always illuminated: Main S2 closes, load is supplied by S2.
Bypass S1	Always illuminated: Bypass S1 closes, load is supplied by S1.
Bypass Open	Always illuminated: Bypass is open.
Bypass S2	Always illuminated: Bypass S2 closes, load is supplied by S2.

6.2 KEY FUNCTION DESCRIPTION

Table 6 – Buttons Function Description

Icon	Buttons	Function Description
I	Main S1 Close	Active when bypass is locked (main is unlocked) in manual mode; Press and if main S1 has opened, main S1 close outputs; When Sync close is active, if main S2 has closed, press and main S1 sync close outputs; when main S1 is waiting for Sync, press again and it shall stop main S1 Sync close.
O	Main Open	Active when bypass is locked (main is unlocked) in manual mode; Press and main switch shall open.
II	Main S2 Close	Active when bypass is locked (main is unlocked) in manual mode; Press and if main S2 has opened, main S2 close outputs; When Sync close is active, if main S1 has closed, press and main S2 sync close outputs; when main S2 is waiting for Sync, press again and it shall stop main S2 Sync close.
I	Bypass S1 Close	Active when main is locked (bypass is unlocked) in manual mode; Press and if bypass S1 have opened, bypass S1 close outputs; When Sync close is active, if bypass S2 has closed, press and bypass S1 sync close outputs; when bypass S1 is waiting for Sync, press again and it shall stop bypass S1 Sync close.
O	Bypass Open	Active when main is locked (bypass is unlocked) in manual mode; Press and bypass switch shall open.
II	Bypass S2 Close	Active when main is locked (bypass is unlocked) in manual mode; Press and if bypass S2 have opened, bypass S2 close outputs; When Sync close is active, if bypass S1 has closed, press and bypass S2 sync close outputs; when bypass S2 is waiting for Sync, press again and it shall stop bypass S2 Sync close.
	Manual/ Auto	Manual mode and Auto mode switchover.
M/BP	Main/ Bypass	Main switch and bypass switch switchover.
	Return/ Homepage	When parameters are being set, press it and the page shall return back. In main screen, press the key to return the first screen; in another screen, press the key to return to main screen.
/OK	Set/Confirm	In main screen, press the key to enter into menu. In menu screen, press this key can move cursor and confirm set information.
▲/	Up/Mute	In main screen, press the key to scroll up screen. In menu interface, press this key to move up cursor or increase value. In main interface, press longer to mute alarm.
▼/	Down/ Lamp Test	In main screen, press the key to scroll down screen. In menu interface, press this key to move down cursor or decrease value. In main screen, press the key longer to enter lamp test mode, LCD is backlit and all LED lamps are lit and LCD screen display goes black.

7 LCD DISPLAY

7.1 MAIN SCREEN

Table 7 - Screen Display

Items	Display Contents
Homepage	S1 power status, S2 power status, switch status; Supply system diagram; S1/S2 voltage and frequency; S1/S2 switching priority; Genset status; Breaker position information; Auto Trans/Restore status;
S1 Power S2 Power	S1 line voltage, phase voltage and frequency, phase angle. S2 line voltage, phase voltage and frequency, phase angle.
Load	3-phase current (I1,I2,I3); 3-Phase Active Power kW (P1,P2,P3); 3-Phase Reactive Power (Q1,Q2,Q3); 3-Phase Apparent Power kVA(S1,S2,S3); Total Active Power kW (sum of P1,P2,P3); Total Reactive Power kvar (sum of Q1,Q2,Q3); Total Apparent Power kVA(sum of S1,S2,S3); 3-Phase Power Factor PF(PF1,PF2,PF3); Average Power Factor PF(average of PF1,PF2,PF3);
S1 Total S2 Total	S1 Total Active Power; S1 Total Reactive Power; MS1 Close Times; BPS1 Close Times; S2 Total Active Power; S2 Total Reactive Power; MS2 Close Times; BPS2 Close Times;
Supply Time	S1 Total Supply Time; S2 Total Supply Time; Power Supply Time (currently); Continuous Power Supply Time (Last Time);
I/O	Programmable digital input status and auxiliary status; Programmable digital output status and LONO supply status;
Comm.	RS485-1 Comm. Status and Baud Rate; RS485-2 Comm. Status and Baud Rate; USB Comm. Status
Alarms	Present alarm informations (Warning Alarm and Fault Alarm)

Items	Display Contents
SYNC 	Voltage difference; Frequency difference; Phase difference; Only for PTS-WST-8BS.
Status	Alarm status/working status; Real-time clock; Status line is showed below in each main screen page.

7.2 STATUS DESCRIPTION

Table 8 - S1 Voltage Status

No.	Item	Description
1	S1 Available	S1 Normal Delay;
2	S1 Unavailable	S1 Abnormal Delay;
3	S1 Available	Power supply voltage is within the setting range.
4	S1 Blackout	Voltage is 0;
5	S1 Over Volt	Voltage is higher than the set upper value;
6	S1 Under Volt	Voltage is below the set lower value;
7	S1 Over Freq	Frequency is higher than the set upper value;
8	S1 Under Freq	Frequency is below the set lower value;
9	S1 Loss of Phase	Loss of one or two phases among A, B and C;
10	S1 Phase Seq Wrong	A-B-C phase sequence is wrong.

Table 9 - S2 Voltage Status

No.	Item	Description
1	S2 Available	S2 Normal Delay;
2	S2 Unavailable	S2 Abnormal Delay;
3	S2 Available	Power supply voltage is within the setting range.
4	S2 Blackout	Voltage is 0.
5	S2 Over Volt	Voltage is higher than the set upper value.
6	S2 Under Volt	Voltage is below the set lower value.
7	S2 Over Freq	Frequency is higher than the set upper value.
8	S2 Under Freq	Frequency is below the set lower value.
9	S2 Loss of Phase	Loss of one or two phases among A, B and C;
10	S2 Phase Seq Wrong	A-B-C phase sequence is wrong.

Table 10 - Genset Status

No.	Item	Description
1	Genset Start Delay	Delay time before genset start;
2	Genset Stop Delay	Delay time before genset stop;
3	Scheduled Not Work	When scheduled not run is active, its duration time will be displayed.
4	Scheduled Work	When scheduled run is active, its duration time will be displayed.
5	S1 Cycle Run	S1 cycle run countdown will be terminated when cycle start is active.
6	S2 Cycle Run	S2 cycle run countdown will be terminated when cycle start is active.
7	S1 Genset Working	Active only when system has 2 gensets and S1 is generating.
8	S2 Genset Working	Active only when system has 2 gensets and S2 is generating.
9	Genset Working	Genset start signal outputs.
10	Genset Standby	There is no start genset signal output.

Table 11 - Switch Status

No.	Item	Description
1	Ready to Transfer	Switch transfer begins.
2	Closing MS1	MS1 closing delay is in progress.
3	Opening MS1	MS1 opening delay is in progress.
4	Closing MS2	MS2 closing delay is in progress.
5	Opening MS2	MS2 opening delay is in progress.
6	Transfer Rest	Interval time between switch transfer
7	Closing MS1 Again	It's the second close time when first MS1 open fails if the re-close delay is not 0.
8	Opening MS1 Again	It's the second open time when first MS1 close fails if the re-open delay is not 0.
9	Closing MS2 Again	It's the second close time when first MS2 open fails if the re-close delay is not 0.
10	Opening MS2 Again	It's the second open time when first MS2 close fails if the re-open delay is not 0.
11	Waiting for Sync	Delay time for waiting sync conditions (volt difference, freq. difference, and phase difference) of MS1 and MS2 are satisfied.
12	MS1 Sync Close	After Sync conditions are satisfied, MS1 Sync close outputs.
13	MS2 Sync Close	After Sync conditions are satisfied, MS2 Sync close outputs.
14	Waiting MS1 PF	Before MS1 is closed, it's the delay time to confirm "S1 PF Input" signal is active.
15	Waiting MS2 PF	Before MS2 is closed, it's the delay time to confirm "S2 PF Input" signal is active.
16	Elevator Delay	Delay time before ATS transfer, and elevator control outputs.
17	MS1 On Load	Main switch S1 was already closed and S1 is taking load.
18	MS2 On Load	Main switch S2 was already closed and S2 is taking load.
19	Offload	Switch was already opened and load is disconnected.
20	Closing Bypass S1	Delay for bypass S1 closing.
21	Opening Bypass S1	Delay for bypass S1 opening.
22	Closing Bypass S2	Delay for bypass S2 closing.
23	Opening Bypass S2	Delay for bypass S2 opening.
24	Bypass S1 On Load	Bypass S1 was closed and S1 is taking load.
25	Bypass S2 On Load	Bypass S2 was closed and S2 is taking load.
26	S1 Parallel On Load	Main and bypass in parallel provides power supply.
27	S2 Parallel On Load	Main and bypass in parallel provides power supply.
28	Waiting for Sync	Delay time for waiting sync conditions (volt difference, freq. difference, and phase difference) of BPS1 and BPS2 are satisfied.
29	BPS1 Sync Close	After Sync conditions are satisfied, BPS1 Sync close outputs.
30	BPS2 Sync Close	After Sync conditions are satisfied, BPS2 Sync close outputs.

Warning alarms are active when controller detects the alarm signals, and alarm indicator will flash slowly (1 time per sec). When alarm is reset, indicator is extinguished, which means warn alarms are not latched.

Table 12 - Warning Alarms

No.	Item	Description
1	S1 Over Current Warn	When the S1 current has exceeded the pre-set value and the action selects “Warn”, it will initiate a warning alarm.
2	S2 Over Current Warn	When the S2 current has exceeded the pre-set value and the action selects “Warn”, it will initiate a warning alarm.
3	Forced Open Warn	When the input is active and the action (cut off non-fire supply) selects “Warn”, it will initiate a warning alarm.
4	Battery Under Volt	When the battery voltage has fallen below the pre-set value, it will initiate a warning alarm.
5	Battery Over Volt	When the battery voltage has exceeded the pre-set value, it will initiate a warning alarm.
6	Fail to Sync	When sync waiting is overtime and fail to sync action selects "Warn", it will initiate a warning alarm.

Fault alarms are active when controller detects the alarm signals. Alarm indicator will flash rapidly (5 times per sec) and the alarm will last until it was removed manually. Fault alarms are latched.

Table 13 - Fault Aalrms

No.	Item	Description
1	S1 Failed to Close	S1 fails to close when S1 is closing.
2	S1 Failed to Open	S1 fails to open when S1 is opening.
3	S2 Failed to Close	S2 fails to close when S2 is closing.
4	S2 Failed to Open	S2 fails to open when S2 is opening.
5	S1 Over Current Trip	When the S1 is taking load and its current has exceeded the pre-set value, and the action selects “Trip”, it will initiate a trip alarm.
6	S2 Over Current Trip	When the S2 is taking load and its current has exceeded the pre-set value and the action selects “Trip”, it will initiate a trip alarm.
7	Forced Open Fault	When the input is active and the action (cut off non-fire supply) selects “Fault”, it will initiate a fault alarm.
8	S1 Genset Fault	Only when system has 2 gensets and S1 is generating, S1 fails to start.
9	S2 Genset Fault	Only when system has 2 gensets and S2 is generating, S2 fails to start.
10	Switch Trip Alarm	It will initiate a fault alarm, when the input is active.
11	Fail to Sync	When sync waiting is overtime and fail to sync action selects "Fault", it will initiate a fault alarm. (only active in auto mode)

The indication information will continuously display for 2s after it is active.

Table 14 - Indication Information

No.	Item	Description
1	Please Reset The Alarm	When there is fault alarm occurs, the indication will be displayed when the genset mode is changed to Auto Mode manually.
2	S1 Already Closed.	The indication information for pressing S2 Close key when S1 is already closed.
3	S2 Already Closed.	The indication information for pressing S1 Close key when S2 is already closed.
5	Panel Locked	The information when panel lock is active and keys are pressed (except for Up/Down/Confirm/Return keys).

Table 15 - Other Status Information

No.	Item	Description
1	Start Inhibit	Genset start inhibit input is active.
2	Remote Inhibit	Remote control inhibit input is active.
3	S1 Load Inhibit	S1 load inhibit input is active.
4	S2 Load Inhibit	S2 load inhibit input is active.
5	NEL 1 Trip	NEL1 off load signal is outputted.
6	NEL2 Trip	NEL2 off load signal is outputted.
7	NEL3 Trip	NEL3 off load signal is outputted.
8	Remote Gen On Load	Remote start (on load) signal is active.
9	Remote Gen Off Load	Remote start (off load) signal is active.
10	Gen Start Mains NG	Start genset when Mains is abnormal.
11	Cycle Start Mode	Active when S1 and S2 are both generating.
12	Balanced Running Start Mode	Active when S1 and S2 are both generating.
13	Master/Backup Start Mode	Active when S1 and S2 are both generating.
14	Auto Mode	Current mode is Auto mode.
15	Manual Mode	Current mode is Manual mode.

7.3 MAIN MENU

In main screen, press ⚙/OK key to enter into the menu interface.

1.Configuration **2.Data Calibration** **3. Historical Records** **4. Black Box Records** **5. AutoTrans./Restore** **6. Start/Stop Genset** **7. Language** **8. About**	Press **Up/Down** key to choose parameters (the current line was highlighted with black) and then press **Confirm** key to enter into the corresponding display screen.

NOTE1：Default password is 01234 before going into parameter setting, users can change it to prevent others changing the parameter settings. Please clearly remember the password after changing. If you forget it, please contact SmartGen services.

NOTE2：Data Calibration is for factory use only and factory password must be inputted before using it.

8 START/STOP OPERATION

8.1 MANUAL START/STOP

8.1.1 PANEL START/STOP

In the main screen, press Set key to enter menu interface, and choose “Manual Test Genset” and press Confirm key, manual start operation interface is entered.

Manual Test Genset	Press “Up/Down” key to choose parameters (the current line was highlighted with black) and then press “Confirm” key to confirm.
0. Return 1. Genset Stop 2. Genset Start	

Genset Stop：Disconnect the start signal, i.e. stop the running genset.

Genset Start：Output the start signal, i.e. start the genset.

When system is “S1 Gens S2 Gens S3 Mains”, manual start/stop menu interface is as follows:

Manual Test Genset	Press “Up/Down” key to choose parameters (the current line was highlighted with black) and then press “Confirm” key to confirm.
0. Return 1. S1 Genset Stop 2. S1 Genset Start 3. S2 Genset Stop 4. S2 Genset Start	

S1 Genset Stop：Disconnect the S1 start signal, i.e. stop the running S1 genset.

S1 Genset Start：Output the S1 start signal, i.e. start the S1 genset.

S2 Genset Stop：Disconnect the S2 start signal, i.e. stop the running S2 genset.

S2 Genset Start：Output the S2 start signal, i.e. start the S2 genset.

8.1.2 REMOTE START/STOP

Send remote start/stop signals using MODBUS protocol via RS485 port.

Remote Stop：Disconnect the start signal, i.e. stop the running genset.

Remote Start：Output the start signal, i.e. start the genset.

8.2 AUTO START/STOP

8.2.1 START CONDITIONS

8.2.1.1 INPUT START

Set input port as “Remote Start On Load” or “Remote Start Off Load”, both could not be set simultaneously.

Remote Start on Load： Genset start is outputted and generating is normal, generating closes; when it is inactive, disconnect the genset start signal.

Remote Start off Load： Genset start is outputted and mains is normal, mains close; when mains are abnormal and generating is normal, generating closes, and when it is inactive, the genset start signal is disconnected.

8.2.1.2 Gen Start Mains NG

When mains are abnormal and the genset start is outputted; when generating is normal, generating closes.

8.2.1.3 Gen Start Master

The start signal is outputted when generator has master priority.

8.2.2 GEN-GEN START/STOP

When system is “S1 Gens S2 Gens”, input port start/stop function is as follows:

Remote Start on Load: Detect S1 or S2 start output according to start mode. Genset close relay will active after genset is normal.

Remote Start off Load: Detect S1 or S2 start output according to start mode. Both genset S1 close relay and S2 close relay are deactivated after genset start.

S1 Gens S2 Gens start mode: Cycle Gen Start, Master-slave Gen Start, Balance Gen Hours, Not Used.

Cycle Gen Start:

When remote start is active, S1 and S2 starts according to circular running time. At the first time to start the genset, choose “S1 Start” or “S2 Start” depends on “Priority”. e.g. S1 starts firstly if “S1” has higher priority. Then S1 circular running countdown is started according to the preset delay. At the same time, genset fault check countdown starts. Before fault check if S1 is normal, then S1 takes load; when S1 circular running time is over, then S2 starts. S2 circular running countdown is initiated, at the same time genset fault check countdown is initiated. Before fault check countdown is over, if S2 is normal, S2 starts taking load and S1 stops. In such way, it lasts until remote start is inactive.

During the start process, if there is genset fault alarm (genset fault delay is overtime or genset fault input is active), fail to close or load inhibit alarm occurs, the starting genset will be stopped immediately and the additional genset will be started automatically.

During the circular running process, if “Manual Mode” is selected, the current status will be hold and the “cycle work time” will be suspended.

Master-Slave Gen Start

When remote start is active, master genset starts, during which if current genset faults (power supply delay is overtime or genset fault inputs occur for input ports), close failure, load inhibition occur, current genset is stopped immediately and start the other genset, otherwise master genset starts until remote start is inactive.

Balance Gen Hours

The genset which has the shortest running hours will be started when remote start signal is active. During the start process, if current genset faults (power supply delay is overtime or), close failure, load inhibition occur, current genset is stopped immediately and start the other genset, otherwise master genset starts until remote start is inactive.

For the system of "S1 Gens S2 Gens" to start/stop genset, it should meet following several conditions:

1) It is active in Auto mode;
2) System type is set as "S1 Gens S2 Gens";
3) Output port is set as "S1 genset start" and "S2 genset start";
4) Input port is set as "S1 genset fault input", "S2 genset fault input", and "remote start on load" or "remote start off load";
5) It is need to set "S1 Gen S2 Gen Start Mode";
6) It needs to configure and set "Genset Supply Delay". If start mode is cycle gen start, "S1 Cycle Work Time", "S2 Cycle Work Time" are also needed to set.

Among input ports, "S1 Genset Fault Input", "S2 Genset Fault Input" are optional settings, Genset faults can be judged by "Genset Supply Delay" and there is no need to inquire the fault alarm via input port.

When S1 Gen S2 Gen start type is configured as "Not Used", there is no genset start signals output.

8.2.3 SCHEDULED RUN

Once "Scheduled Run" is enabled, users can set the scheduled start time. Controller will send start signal at preset start time. Start signal will deactivated after the start delay has expired. "Scheduled Run On Load" or "Scheduled Run Off Load" can be set.

Scheduled Run On Load: When the input is active, genset close relay will active after genset is normal.

Scheduled Run Off Load: When the input is active, mains close relay will active after mains is normal.

Circular time of Scheduled Start can be set as start monthly, weekly and daily.

Start Monthly: start month, start date and time can be set.

Start Weekly: Same start time of several days in a week can be set. e. g. Start the genset at 8:00 a.m. from Monday to Friday and it keeps 10 hours.

Start Daily: start the genset at same time everyday can be set.

8.2.4 SCHEDULED NOT RUN

Once "Scheduled Not Run" is enabled, users can set the "Scheduled Not Start" time. Start signal will deactivated at preset time and it will be inhibited before the delay has expired.

Circular time of "Scheduled Not Run" can be set as monthly, weekly and daily.

Not Run Monthly: not start month, not start date and time can be set.

Not Run Weekly: genset start at the same time in couple days of a week can be set. e. g. genset not start at 19:00 p.m. from Monday to Friday and it keeps 12 hours.

Not Run Daily: genset not start at same time everyday can be set.

NOTE3: "Scheduled Not Run" operation is prior to "Scheduled Run" operation.

9 PARAMETERS CONFIGURATION

9.1 ILLUSTRATION

In the main interface, press ⚙/OK key to enter menu interface; choose **Configuration** and press ⚙/OK again to enter into password confirmation interface. If password is correct, enter into parameter setting interface, otherwise, exit to main interface directly. Factory default password is ***01234***. In parameter configuration interface, press ↩/⌂ key to return to the prior menu.

9.2 PARAMETER CONFIGURATION TABLE

Table 16 - Parameter Configuration Form

No.	Parameter Name	Range	Default	Description
AC Setting				
1	S1 Volt Normal	(0~3600) s	10	The delay from S1 voltage abnormal to normal.
2	S1 Volt Abnormal	(0~3600)s	5	The delay from S1 voltage normal to abnormal.
3	S2 Volt Normal	(0~3600)s	10	The delay from S2 voltage abnormal to normal.
4	S2 Volt Abnormal	(0~3600)s	5	The delay from S2 voltage normal to abnormal.
5	Master Set	(0~1)	0	0: S1 Master 1: S2 Master
6	System Type	(0~3)	0	0: S1M S2G 1: S1G S2M 2: S1M S2M 3: S1G S2G
7	AC System	(0~3)	0	0: 3 Phase,4 Wire (3P4W) 1: 3 Phase,3 Wire (3P3W) 2: 2 Phase,3 Wire (2P3W) 3: Single Phase,2 Wire (1P2W)
8	PT Fitted	(0~1)	0	0: Disable; 1: Enable
9	PT Primary	(30~30000)V	100	Primary voltage of potential transformer
10	PT Secondary	(30~1000)V	100	Secondary voltage of potential transformer
11	Rated Voltage	(0~30000)V	220	Rated voltage of AC system
12	Over Volt Warn	(0~1)	1	0: Disable ; 1: Enable
13	Set Value	(0~200)%	120	Upper limit value of voltage; it is abnormal if the value has exceeded the set value.
14	Return	(0~200)%	115	Upper limit return value of voltage; it is normal only when the value has fallen below the set value.

No.	Parameter Name	Range	Default	Description
15	Under voltage Warn	(0~1)	1	0: Disable ; 1: Enable
16	Set Value	(0~200)%	80	Lower limit value of voltage; it is abnormal if the value has fallen below the set value.
17	Return Value	(0~200)%	85	Lower limit return value of voltage; it is normal only when the value has exceeded the set value.
18	Rated Frequency	(10.0~75.0)Hz	50.0	Rated frequency of AC system
19	Over Frequency Warn	(0~1)	1	0: Disable ; 1: Enable
20	Set Value	(0~200)%	110	Upper limit value of frequency; it is abnormal if the value has exceeded the set value.
21	Return Value	(0~ 200)%	104	Upper limit return value of frequency; it is normal only when the value has fallen below the set value.
22	Under Frequency Warn	(0~1)	1	0: Disable ; 1: Enable
23	Set Value	(0~ 200)%	90	Lower limit value of frequency; it is abnormal if the value has fallen below the set value.
24	Return Value	(0~ 200)%	96	Lower limit return value of frequency; it is normal only when the value has exceeded the set value.
25	Phase Sequence Wrong	(0~1)	1	0: Disable ; 1: Enable
Switch				
1	Bypass Function Type	(0~1)	0	0:DBTSE 1: SBTSE
2	Bypass Switch Type	(0~2)	1	0:MTSE 1:RTSE 2: Mutual Backup RTSE
3	ATS Power Type	(0~1)	1	0: DC Power Supply 1: AC Power Supply
4	ATS Power Low Point	(0~100)%	70	The lowest AC voltage supply; Switch can't be transferred if it is lower than it.
5	ATS Power High Point	(0~200)%	130	The highest AC voltage supply; Switch can't be transferred if it is higher than it.
6	Auto Trans./Restore	(0~1)	1	0: Auto Trans./Non-Res. 1: Auto Trans./Restore
7	Fixed Close/Open Time	(0~1)	0	0: Disable ; 1: Enable Disable: The output time was judged by the close relay; the longest output time is up to the set delay. Enable: The output time lasts for the preset time.

No.	Parameter Name	Range	Default	Description
8	Close Delay	(0.1~20.0)s	5.0	Pulse time of close relay.
9	Open Delay	(0.1~20.0)s	5.0	Pulse time of open relay.
10	Transfer Interval	(1~9999)s	1	Interval time from S1 switch open to S2 switch close; or from S2 switch open to S1 switch close.
11	Again Close Time	(0~20.0)s	1.0	Close again occurs when the first open fails, and close again delay also starts. When the delay is over, then open occurs again. If open cannot happen, then failed to open alarm signal is sent.
12	Again Open Time	(0~20.0)s	1.0	Open again occurs when the first close fails, and open again delay also starts. When the delay is over, then close occurs again. If close cannot happen, then failed to close alarm signal is sent.
13	Switch Type	(0~1)	0	0: Two Breakings 1: One Breaking
14	Forced Open Action	(0~1)	0	0: Warn Alarm 1: Fault Alarm
15	Continually Close	(0~1)	0	0: Disable ; 1: Enable If close control is continous signal, and this function is needed, close time and open time are inactive.
16	Sync Enabled	(0~1)	0	0: Disable 1: Enable
17	Volt Diff. Enabled	(0~1)	0	0: Disable 1: Enable
18	Volt Diff.	(0~50)V	5	Max. volt difference at sucessful sync.
19	Freq Diff.	(0~0.50)Hz	0.20	Max. freq difference at sucessful sync.
20	Phase Diff.	(0~20) °	5	Max. phase difference at sucessful sync.
21	Fail to Sync Action	(0~1)	0	0: Warn Alarm 1: Fault Alarm After sync failed, it still waits to sync; until sync is finished it closes. For warning alarm, it is cleared when sync is finished or it exits from sync; For fault alarm, press alarm reset key to clear the alarm; In manual mode, only warning alarm is active; it is not based on set alarm actions.
22	Transfer On Sync Fail	(0~1)	0	0: Disable 1: Enable After sync fails, non-sync close shall be executed and none fail to sync alarms shall be issued (only active in auto mode).
23	Fail to Sync Delay	(0~9999)s	120	Waiting time for sucessful sync; sync fails when it is overtime.
24	Breaker Feedback Time	(0.1~1.0)s	0.6	Sync close/open output delay starts at sync transfer, during which if correct close status is detected, stop to close/open

No.	Parameter Name	Range	Default	Description
				pulse outputs; if delay is over, correct close status is not detected still, then fail to close/open alarm is initiated.
Generator				
1	Start Delay	(0~9999)s	1	When the genset is ready to start, start delay begins, after the start delay has expired, start signal will be initiated.
2	Stop Delay	(0~9999)s	5	When the genset is ready to stop, stop delay begins, after the stop delay has expired, stop signal will be initiated.
3	S1 Gen S2 Gen Start Mode	(0~3)	0	0: Cycle Gens 1: Master-Slave Gens 2: Balance Gens Hours 3: Not Used
4	S1 Cycle Work Time	(0~9999)min	720	S1 running time for cycle start
5	S2 Cycle WorkTime	(0~9999)min	720	S2 running time for cycle start
6	Supply Delay	(0~9999)s	120	Time from genset signal is sent to gen voltage is normal; if delay is over and voltage is still not abnormal, genset failt alarm occurs.
7	Battery Volt Enable	(0~1)	0	0: Disable ; 1: Enable
8	Battery LV Warn Enable	(0~1)	0	0: Disable ; 1: Enable
9	Battery LV Warn	(0~100.0)V	10.0	When battery voltage is below the set return, LV warning occurs.
10	Battery LV Return	(0~100.0)V	10.5	When voltage is above the set return, LV warning is removed.
11	Battery LV Delay	(0~3600)s	60	Delay time when voltage is below the LV warning limit; when delay is over, LV warning occurs.
12	Battery OV Warn Enable	(0~1)	0	0: Disable 1: Enable
13	Battery OV Warn	(0~100.0)V	30.0	When voltage is above the set limit, OV warning occurs.
14	Battery OV Return	(0~100.0)V	29.5	When voltage is below the set return, OV warning is removed.
15	Battery OV Delay	(0~3600)s	60	Delay time when voltage is above the OV warning limit; when the delay is over, OV warning occurs.
Scheduler				
1	Schedule Gen Enable	(0~1)	0	0: Disable ; 1: Enable
2	Schedule Load	(0~1)	0	0: Off Load 1: On Load
3	Schedule Period	(0~2)	0	0: Monthly 1: Weekly 2: Daily

No.	Parameter Name	Range	Default	Description
4	Schdule Monthly	Optional month		☑January ☑February ☑March ☑April ☑May ☑June ☑July ☑August ☑September ☑October ☑November ☑December
		Day(1~31)	1	Date for genset start in every month.
5	Schedule Weekly	Optional week		☑Sunday ☐Monday ☐Tuesday ☐Wednesday ☐Thursday ☐Friday ☐Saturday
6	Schdule Hours	(0~23)h	0	Scheduled time for starting genset.
7	Schdule Minutes	(0~59)min	0	
8	Schdule Work Time	(0~30000)min	30	Lasting time for scheduled running.
9	Gen Inhibit Work Set	(0~1)	0	0: Disable 1: Enable
10	Inhibit Period	(0~2)	0	0: Monthly 1: Weekly 2: Daily
11	Inhibit Monthly	Optional month		☑January ☑February ☑March ☑April ☑May ☑June ☑July ☑August ☑September ☑October ☑November ☑December
		Day(1~31)	1	Date for not starting genset in each month
12	Inhibit Weekly	Optional week		☑Sunday ☐Monday ☐Tuesday ☐Wednesday ☐Thursday ☐Friday ☐Saturday
13	Inhibit Hours	(0~23)h	0	Date of not starting the genset
14	Inhibit Minutes	(0~59)min	0	
15	Inhibit Rest Time	(0~30000)s	30	Lasting time of not startting the genset
Load				
1	Elevator Enable	(0~1)	0	0: Disable ; 1: Enable
2	Elevator Delay	(0~300)s	300	Delay time before load is power off and switch transfer, which is used to control the running elevator stops at the nearest floor until switch transfer is over.
3	Current CT Enable	(0~1)	1	0: Disable ; 1: Enable
4	CT Primary	(5~6000)A	500	CT primary current
5	S1 Full Load Rating	(5~6000)A	500	Full load current of S1 taking load
6	S1 Full Load Rating	(5~6000)A	500	Full load current of S2 taking load
7	S1 Max kW Rating	(1~20000)kW	200	The maximum active power of S1 taking load
8	S2 Max kW Rating	(1~20000)kW	200	The maximum active power of S2 taking load
9	Over Current Enable	(0~1)	1	0: Disable ; 1: Enable
10	Over Load Current	(0~200)%	120	Over current set limit values

No.	Parameter Name	Range	Default	Description
11	Over Current Action	(0~1)	0	0: Warn 1: Trip
12	Over Current Type	(0~1)	0	0：Definite Time 1：IDT(Inverse DefiniteTime)
13	Over Current Delay (value)	(0~3600)s	10	It's the over current delay time when "Definite Time" is selected.
14	Inverse Definite Delay (Multiplier)	(1~36)	36	It's the over current multiplier when "IDT" is selected.
15	NEL Trip Enable	(0~1)	0	0: Disable ; 1: Enable
16	NEL OverPower Val 1	(0~200)%	90	When load power is above the set value, and delay is over, unload control outputs.
17	NEL OverPowerDelay1	(0~3600)s	5	
18	NEL OverPower Val 2	(0~200)%	100	When load power is above the set value, and delay is over, unload control outputs.
19	NEL OverPowerDelay2	(0~3600)s	1	
20	NEL Return Enable	(0~1)	0	0: Disable ; 1: Enable
21	NEL Return Value	(0~200)%	50	When load power is below the set value, and delay is over, trip disconnection control outputs.
22	NEL Return Delay	(0~3600)s	5	
23	NEL Nums	(1~3)	3	NEL number
24	Mains Load NEL Enable	(0~1)	0	0: Disable ; 1: Enable
Digit Inputs				
1	Digital Input 1	(0~50)	1	Forced Open
2	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
3	Digital Input 2	(0~50)	8	Breaker Trip Input
4	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
5	Digital Input 3	(0~50)	30	BTS Unlocked
6	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
7	Digital Input 4	(0~50)	31	ATS In Work
8	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
9	Digital Input 5	(0~50)	32	ATS In Test
10	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
11	Digital Input 6	(0~50)	35	ATS Unlocked
12	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate

No.	Parameter Name	Range	Default	Description
13	Digital Input 7	(0~50)	36	BTS In Work
14	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
15	Digital Input 8	(0~50)	37	BTS In Test
16	Active Type	(0~1)	0	0: Close to activate; 1: Open to activate
Relay Outputs				
1	Relay Output 1 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
2	Relay Output 1	(0~105)	34	MS1 Close Control
3	Relay Output 2 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
4	Relay Output 2	(0~105)	36	MS2 Close Control
5	Relay Output 3 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
6	Relay Output 3	(0~105)	35	MS1 Open Control
7	Relay Output 4 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
8	Relay Output 4	(0~105)	37	MS2 Open Control
9	Relay Output 5 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
10	Relay Output 5	(0~105)	90	BPS1 Close Control
11	Relay Output 6 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
12	Relay Output 6	(0~105)	92	BPS2 Close Control
13	Relay Output 7 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
14	Relay Output 7	(0~105)	91	BPS1 Open Control
15	Relay Output 8 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
16	Relay Output 8	(0~105)	93	BPS2 Open Control
17	Relay Output 9 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
18	Relay Output 9	(0~105)	89	Parallel Power Supply Warning
19	Relay Output 10 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
20	Relay Output 10	(0~105)	0	Not Used
21	Relay Output 11 Active Type	(0~1)	1	0: Output (NO) 1: Output (NC)
22	Relay Output 11	(0~105)	32	Genset start Output
23	Relay Output 12 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)

No.	Parameter Name	Range	Default	Description
24	Relay Output 12	(0~105)	0	Not Used
25	Combined 1 Or Out 1 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
26	Combined 1 Or Out 1 Contents Setting	(0~105)	23	S1 Available
27	Combined 1 Or Out 2 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
28	Combined 1 Or Out 2 Contents Setting	(0~105)	25	S2 Available
29	Combined 1 And Out Active Type	(0~1)	1	0: Output (NO) 1: Output (NC)
30	Combined 1 And Out Contents Setting	(0~105)	0	Not Used
31	Combined 2 Or Out 1 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
32	Combined 2 Or Out 1 Contents Setting	(0~105)	0	Not Used
33	Combined 2 Or Out 2 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
34	Combined 2 Or Out 2 Contents Setting	(0~105)	0	Not Used
35	Combined 2 And Out Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
36	Combined 2 And Out Contents Setting	(0~105)	0	Not Used
37	Combined 3 Or Out 1 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
38	Combined 3 Or Out 1 Contents Setting	(0~105)	0	Not Used
39	Combined 3 Or Out 2 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
40	Combined 3 Or Out 2 Contents Setting	(0~105)	0	Not Used
41	Combined 3 And Out Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
42	Combined 3 And Out Contents Setting	(0~105)	0	Not Used
43	Combined 4 Or Out 1 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
44	Combined 4 Or Out 1 Contents Setting	(0~105)	0	Not Used
45	Combined 4 Or Out 2 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
46	Combined 4 Or Out 2	(0~105)	0	Not Used

No.	Parameter Name	Range	Default	Description
	Contents Setting			
47	Combined 4 And Out Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
48	Combined 4 And Out Contents Setting	(0~105)	0	Not Used
49	Combined 5 Or Out 1 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
50	Combined 5 Or Out 1 Contents Setting	(0~105)	0	Not Used
51	Combined 5 Or Out 2 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
52	Combined 5 Or Out 2 Contents Setting	(0~105)	0	Not Used
53	Combined 5 And Out Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
54	Combined 5 And Out Contents Setting	(0~105)	0	Not Used
55	Combined 6 Or Out 1 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
56	Combined 6 Or Out 1 Contents Setting	(0~105)	0	Not Used
57	Combined 6 Or Out 2 Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
58	Combined 6 Or Out 2 Contents Setting	(0~105)	0	Not Used
59	Combined 6 And Out Active Type	(0~1)	0	0: Output (NO) 1: Output (NC)
60	Combined 6 And Out Contents Setting	(0~105)	0	Not Used
Module Settings				
1	Power On Mode	(0~2)	0	0: Last Mode (Keep the working mode before power off) 1: Manual Mode 2: Auto Mode
2	Language	(0~2)	0	0: Chinese 1: English 2: Other (Language can be set via PC software, Default: Traditional Chinese)
3	Password	(00000~65535)	01234	For entering parameter setting.
4	Module Address	(1~254)	1	RS485 communication address (one module address is shared)
5	RS485-1 Baud	(0~3)	2	0: 2400 bps 1: 4800 bps 2: 9600 bps

No.	Parameter Name	Range	Default	Description
				3: 19200 bps
6	RS485-1 Stop Bit	(1~2)	2	2 stop bits or 1 stop bit can be set.
7	RS485-1 Parity	(0~2)	0	0:None Parity 1:Odd Parity 2:Even Parity
8	RS485-1 COM Set	(0~3)	0	0:Enable COMAdj/Ctrl 1:Disable COMControl 2:Disable COM Adjust 3:DisableCOMAdj/Ctrl
9	RS485-2 Baud Rate	(0~3)	2	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps
10	RS485-2 Stop Bit	(1~2)	2	2 stop bits or 1 stop bit can be set.
11	RS485-2 Parity	(0~2)	0	0:None Parity 1:Odd Parity 2:Even Parity
12	RS485-2 COM Set	(0~3)	0	0:Enable COMAdj/Ctrl 1:Disable COMControl 2:Disable COM Adjust 3:DisableCOMAdj/Ctrl
13	Date/Time Set			
14	Key Tips Enable Set	(0~1)	0	0: Disable 1: Enable (Note: All keys except Return/Home, Set/Confirm, Up/Mute, Down/Lamp Test, are pressed and “Sure To Press?” reminder shall appear; Press Up, Down to confirm or cancel, and press Set to confirm the setting and the reminder shall disappear.
15	Controller Description 1	(0~20) characters		“About” information is displayed. Any characters can be inputted via PC software (letter occupies 1 character, Chinese character occupies 2.).
16	Controller Description 2	(0~20) characters		

9.3 DIGITAL INPUT/OUTPUT FUNCTION DESCRIPTION

9.3.1 INPUT PORTS FUNCTION

Table 17 - Input Port Function Description

No.	Item	Description
0	Not Used	Invalid
1	Forced Open	No matter the genset is in manual mode or auto mode, when the input is active, this will force the breaker to transfer the ATS to OFF position. “No Breaking” ATS is unavailable.
2	Remote Start Onload	Genset start output: when Mains is normal, gen breaker closes.
3	Remote Start Offload	Genset start output: when Mains is abnormal, mains breaker closes.
4	Lamp Test	All indicators on the panel are light on; LCD backlight is on; LCD is dark.
5	Gen1 Fault Input	In cycle start, if the input is active, S1 Gens start will be inhibited.
6	Gen2 Fault Input	In cycle start, if the input is active, S2 Gens start will be inhibited.
7	Start Inhibit Input	Inhibit genset start signal output; in auto mode, after stop delay, it will disconnect genset start signal output; in manual mode, if genset has started, then it needs to stop the genset manually; when it is stopped, start is inactive.
8	Breaker Trip Input	Trip failure input
9	S1 Close Inhibit	In manual mode, S1 manual close is inhibited; if breaker is already closed, users should open it manually. In auto mode, if breaker is already closed, then close relay will be deactivated or S2 take load.
10	S2 Close Inhibit	In manual mode, S2 manual close is inhibited; if breaker is already closed, users should open it manually. In auto mode, if breaker is already closed, then close relay will be deactivated or S1 take load.
11	QS1 Breaker PF Input	When the S1 PF input is active, S1 close relay will be activated.
12	QS2 Breaker PF Input	When the S2 PF input is active, S2 close relay will be activated.
13	Reserved	
14	Reserved	
15	Alarm Reset	Reset the current alarm.
16	Alarm Mute	Silence the audible alarm.
17	NEL Trip Key	Control the NEL off load manually. Self-reset button is recommended.
18	NEL Return Key	Control the NEL on load again manually. Self-reset button is recommended.
19	S1 Master Input	Set S1 master use compulsively.
20	S2 Master Input	Set S2 master use compulsively.
21	Forced Manual Mode	Set the controller in Manual mode compulsively.
22	Forced Auto Mode	Set the controller in Auto mode compulsively.
23	Panel Lock	Panel button operation is inhibited (Except Up, Down, Confirm, Return, Reset and Mute keys)
24	Sync Transfer Inhibit	When it is active, sync transfer function is inactive. (PTS-WST-8BS)
25	Scheduler Inhibit	Schedule Start and Schedule Not Start function are deactivated.
26	Simulate S1 OK	Simulate S1 voltage is normal; the S1 voltage abnormal delay is deactivated.

No.	Item	Description
27	Simulate S2 OK	Simulate S2 voltage is normal; the S2 voltage abnormal delay is deactivated.
28	Reserved	
29	Reserved	
30	BTS Unlocked Out	BTS unlocked status input; bypass indicator shall be illuminated and bypass switch is available when it is active.
31	ATS In Work	Main ATS is in working position.
32	ATS In Test	Main ATS is in testing position.
33	Reserved	
34	Reserved	
35	ATS Unlocked Out	ATS unlocked status input; ATS indicator shall be illuminated and main switch is available when it is active.
36	BTS In Work	BTS is in working position.
37	BTS In Test	BTS is in testing position.
38	Overhaul Unlock	Overhaul unlock output lasts for 1min when its input port (Self-recover button) is triggered and active.
39	Auto Trans./Rec.	Active when it is active, and Auto transfer and non-recover when it is not active.
40	Reserved	
41	MS1 Close Key	Same as MS1 Close key on the panel, which is used to control S1 close, and Self-recover button shall be chosen.
42	Main Open Key	Same as open key of main switch, which is used to control switch open, and Self-recover button shall be chosen.
43	MS2 Close Key	Same as MS2 Close key on the panel, which is used to control S2 close, and Self-recover button shall be chosen.
44	BPS1 Close Key	Same as bypass S1 Close key on the panel, which is used to control bypass S1 close, and Self-recover button shall be chosen.
45	Bypass Open Key	Same as open key of bypass switch, which is used to control bypass switch open, and Self-recover button shall be chosen.
46	BPS2 Close Key	Same as bypass S2 Close key on the panel, which is used to control bypass S2 close, and Self-recover button shall be chosen.
47	M/BP Key	Same as unlock key of main/bypass on the panel to transfer between main/bypass switch status, and Self-recover button shall be chosen.
48	MAN/AUTO Key	Same as Manual/Auto key, which is used to control simulate manual/auto mode transfer, and Self-recover button shall be chosen.
49	Remote Control Inhibit	Remote control is invalid when the input is active.
50	Reserved	

9.3.2 OUTPUT PORTS FUNCTION

Table 18 - Output Port Function Description

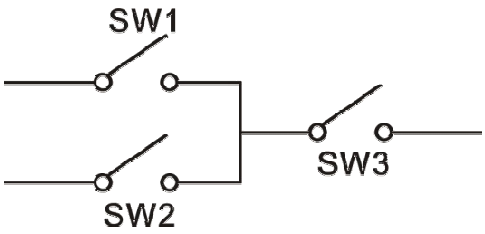
No.	Items	Description
0	Not Used	Invalid
1	Custom Combined 1	For details please refer to the back description.
2	Custom Combined 2	
3	Custom Combined 3	
4	Custom Combined 4	
5	Custom Combined 5	
6	Custom Combined 6	
7	Reserved	
8	Reserved	
9	Reserved	
10	Reserved	
11	Common Alarm	It includes fault alarm and warning alarm.
12	Common Fault Alarm	It includes Transition Fault alarm and Over Current Trip alarm.
13	Common Warn Alarm	It includes “S1 Phase Sequence Wrong” alarm, “S2 Phase Sequence Wrong” alarm, and “Forced Open” alarm.
14	Transition Fault	It includes “S1 Fail to Close” alarm, “S1 Fail to Open” alarm, “S2 Fail to Close” alarm, “S2 Fail to Open” alarm.
15	Audible Alarm	When common alarm is active, annunciator can be connected externally. When “alarm mute” input is active in input port or 60s delay has expired, it can remove the alarm.
16	Reserved	
17	Genset Start Delay	Output when start signal is initiated.
18	Genset Stop Delay	Output when stop signal is initiated.
19	Elevator Control	Output before the load disconnected or switch transfer. Used to control the running elevator stop at the nearest floor until the switch transfer is terminated.
20	Overhaul Unlock Out	Unlock output lasts for 1min when input port (Self-recover button) is triggered and active.
21	Reserved	
22	Reserved	
23	S1 Available	Output when S1 power is normal.
24	S1 Unavailable	Output when S1 power is abnormal.
25	S2 Available	Output when S2 power is normal.
26	S2 Unavailable	Output when S2 power is abnormal.
27	S1 Over Current	Output when S1 over current occurs.
28	S2 Over Current	Output when S2 over current occurs.
29	Reserved	
30	Auto Mode	Output when the genset is in Auto mode.
31	Manual Mode	Output when the genset is in Manual mode.
32	Genset Start Output	Control the genset to start.

No.	Items	Description
33	Reserved	
34	MS1 Close Control	Control the MS1 switch to close.
35	MS1 Open Control	Control the MS1 switch to open.
36	MS2 Close Control	Control the MS2 switch to close.
37	MS2 Open Control	Control the MS2 switch to open.
38	Reserved	
39	Reserved	
40	NEL 1 Trip	It controls NEL offload when output is active; it controls NEL offload return (on load) when output is inactive.
41	NEL 2 Trip	
42	NEL 3 Trip	
43	Reserved	
44	Reserved	
45	MS1 On Feedback	The close status of S1 switch
46	MS2 On Feedback	The close status of S2 switch
47	S1 Genset Start	When the system type is “S1 Gen S2 Gen”, it controls the S1 genset start.
48	S2 Genset Start	When the system type is “S1 Gen S2 Gen”, it controls the S2 genset start.
49	Reserved	
50	Reserved	
51	Reserved	
52	Reserved	
53	Remote Control	Control the output via remote communication command.
54	Input 1 Status	Configurable Input status.
55	Input 2 Status	
56	Input 3 Status	
57	Input 4 Status	
58	Input 5 Status	
59	Input 6 Status	
60	Input 7 Status	
61	Input 8 Status	
62	Reserved	
63	Reserved	
64	S1 Blackout	S1 power supply status
65	S1 Over Volt	
66	S1 Under Volt	
67	S1 Over Freq	
68	S1 Under Freq	
69	S1 Loss of Phase	
70	S1 Phase Seq Wrong	
71	Reserved	
72	Reserved	
73	S2 Blackout	S2 power supply status
74	S2 Over Volt	

No.	Items	Description
75	S2 Under Volt	
76	S2 Over Freq	
77	S2 Under Freq	
78	S2 Loss of Phase	
79	S2 Phase Seq Wrong	
80	Reserved	
81	Reserved	
82	Fail to Sync	Output when sync fails (PTS-WST-8BS);
83	Waiting for Sync	Output when it is waiting for sync (PTS-WST-8BS);
84	Switching	Output during the switch transfer process.
85	Battery Under Volt	Output when battery under voltage alarm occurs.
86	Battery Over Volt	Output when battery over voltage alarm occurs.
87	Gen Inhabit Work	Output during the Schedule Not Run process.
88	Scheduler Gen Start	Output during the Schedule Run process.
89	Parallel Supply	Both of S1 close for main and bypass switches when they are in working position.
90	BPS1 Close Out	Control bypass S1 close.
91	BPS1 Open Out	Control bypass S1 open.
92	BPS2 Close Out	Control bypass S2 close.
93	BPS2 Open Out	Control bypass S2 open.
94	BPS1 On Feedback	Output when bypass S1 is already closed.
95	BPS2 On Feedback	Output when bypass S2 is already closed.
96	BTS Unlocked Out	Output when bypass BTS is unlocked.
97	ATS In Work	Position status for main ATS.
98	ATS In Test	
99	ATS In Isolation	
100	ATS Unlocked Out	Output when main ATS is unlocked.
101	BTS In Work	Position status for bypass switch BTS.
102	BTS In Test	
103	BTS Insolated	
104	Reserved	
105	Reserved	

9.3.3 CUSTOM COMBINATION OUTPUT

Defined combination output is composed by 3 parts, OR conditional output SW1, OR conditional output SW2, AND conditional output SW3.



SW1 or SW2 is **TRUE**, while SW3 is **TRUE**, defined combination output is active;

SW1 and SW2 are **FALSE**, or SW3 is **FALSE**, defined combination output is deactivated.

⚠**NOTE4:** SW1, SW2, SW3 can be set as any contents except for “defined combination output” in the output setting.

⚠**NOTE5:** 3 parts of defined combination output (SW1, SW2, SW3) couldn’t include or recursively include themselves.

Example:

Contents of OR condition output SW1: output port 1 is active;

Close when OR condition output SW1 is active /inactive: close when active (disconnect when inactive);

Contents of OR condition output SW2, output port 2 is active;

Close when OR condition output SW2 is active /inactive: close when active (disconnect when inactive);

Contents of AND condition output SW3: output port 3 is active;

Close when AND condition output SW3 is active /inactive: close when active (disconnect when inactive);

When input port 1 is active or input port 2 is active, if input port 3 is active, defined combination output is outputting; If input port 3 is inactive, defined combination output is not outputting;

When input port 1 is inactive and port 2 is inactive, no matter port 3 is active or not, defined combination output is not outputting.

9.4 DEFINITE TIME AND INVERSE DEFINITE TIME OF OVER CURRENT

Definite Time：overcurrent delay is definite time. Different overcurrent value has the same preset delay.

Inverse Definite Time：overcurrent delay decreases as overcurrent increases. Different overcurrent value has different corresponding delay.

Inverse overcurrent delay formula:

$T = t / ((IA/IT)-1)^2$

T：Overcurrent delay (second)

t：Timing multiplier ratio

IA：Current max. load current（L1/L2/L3）

IT：Set overcurrent value

Example：

t = 36

IA = 550A

IT =500A

Conclusion: T = 3600s(1hour)

10 HISTORICAL RECORDS

In the main screen press ⚙/OK key to enter menu page and select **Historical Records**, and then press ⚙/OK key to confirm, the screen will show the historical records interface.

Each record includes:
Record date and time
Record type
Event log
S1 power supply status
S2 power supply status
S1 3-phase voltage
S2 3-phase voltage
S1 frequency
S2 frequency
Current IA、IB、IC
Active power
Power factor

Maximum pieces of historical record are 200. The first record is latest, and users could check every record by dredging up/down. The latest record will cover the oldest one when record amount exceeds 200.

Event log type includes: Action Event, Warning Event and Fault Event. All fault event actions are fault alarms while all warning event actions are warning alarm.

Table 19 – Action Event List

No.	Action Events	Description
1	MS1 Closing	Record when the MS1 close outputs.
2	MS2 Closing	Record when the MS2 close outputs.
3	Main Opening	Record when main switch open outputs.
4	MS1 Sync Close	Record when MS1 sync close occurs;
5	MS2 Sync Close	Record when MS2 sync close occurs;
6	NEL 1 Unload	Record when NEL 1 unload control outputs.
7	NEL 2 Unload	Record when NEL 2 unload control outputs.
8	NEL 3 Unload	Record when NEL 3 unload control outputs.
9	Genset Start	Record when genset start signal outputs.
10	S1 Genset Start	Record when S1 genset start signal outputs.
11	S2 Genset Start	Record when S2 genset start signal outputs.
12	Genset Stop	Record when genset start signal is deactivated.
13	S1 Genset Stop	Record when S1 genset start signal is deactivated.
14	S2 Genset Stop	Record when S2 genset start signal is deactivated.
15	Auto Mode	Record when the genset mode transferred to Auto Mode.
16	Manual Mode	Record when the genset mode transferred to Module Mode.
17	BPS1 Close	Record when BPS1 close outputs.
18	BPS2 Close	Record when BPS2 close outputs.
19	Bypass Open	Record when bypass switch open outputs.
20	BPS1 Sync Close	Record when BPS1 close outputs;
21	BPS2 Sync Close	Record when BPS2 close outputs;
22	Manual MS1 Close	Operate MS1 close manually.
23	Manual MS2 Close	Operate MS2 close manually.
24	Manual Main Open	Operate main switch open manually.
25	Manual BPS1 Close	Operate BPS1 close manually.
26	Manual BPS2 Close	Operate BPS2 close manually.
27	Manual Bypass Open	Operate bypass switch open manually.
28	Auto MS1 Close	MS1 close in auto mode.
29	Auto MS2 Close	MS2 close in auto mode.
30	Auto Main Open	Main switch opens in auto mode.
31	Auto BPS1 Close	BPS1 close in auto mode.
32	Auto BPS2 Close	BPS2 close in auto mode.
33	Auto Bypass Open	Bypass switch open in auto mode.

11 BLACK BOX RECORDS

In the main screen press ⚙/OK key to enter menu page and select **Black Box Records**, and then press ⚙/OK key again to confirm, the screen will show the black box records interface.

Each record includes:
Record date and time
Record type
Event log
S1 power supply status
S2 power supply status
S1 3-phase voltage
S2 3-phase voltage
S1 frequency
S2 frequency
Current IA、IB、IC
Active power
Power factor

Maximum pieces of black box record are 5. Every event records all data information of this event in previous and backward 60s, and record once per second. The latest record will cover the oldest one when record amount exceeds 5. The first record is latest. Users could check details by pressing Confirm key, and check the 60 data's by dredging up/down.

Event log type: the action event of close/open switching in auto mode.

Table 20 – Action Event List

No.	Action Events	Description
1	Auto MS1 Close	MS1 close in auto mode.
2	Auto MS2 Close	MS2 close in auto mode.
3	Auto Main Open	Main switch opens in auto mode.
4	Auto BPS1 Close	BPS1 close in auto mode.
5	Auto BPS2 Close	BPS2 close in auto mode.
6	Auto Bypass Open	Bypass switch open in auto mode.

12 SWITCH OPERATION

12.1 MANUAL OPERATION

Controller shall be in manual mode by pressing  button and a LED beside the button will illuminate.

In manual mode users can control switch transfer by the keys on the panel.

Manual Bypass Switch:

Bypass switch transfer can only operate manually and bypass close/open keys are inactive.

Remote Bypass Switch:

Main switch and bypass switch both can be operated to close or open on the controller. Switch transfer can also be realized manually via panel keys under the following conditions.

Table 21 – Manual Remote Control of Dual Bypass Switch

Switch	Bypass Switch Locked			Bypass Switch Unlocked		
	Main Switch Work	Main Switch Test	Main Switch Isolation	Main Switch Work	Main Switch Test	Main Switch Isolation
Main Switch	Operable	Operable	Inoperable	Inoperable	Inoperable	Inoperable
Bypass Switch	Inoperable	Inoperable	Inoperable	Operable	Operable	Operable

Mutual Backup Bypass Switch:

Mutual backup bypass switch means main switch and bypass switch can be backup mutually, and main switch and bypass switch can separately be master and backup.

Table 22 – Mutual and Dual Backup Bypass Switches

Manual Close/Open	Master Unlocked, Bypass Locked			Master Locked, Bypass Unlocked		
	Main Switch Work	Main Switch Test	Main Switch Isolation	Main Switch Work	Main Switch Test	Main Switch Isolation
Bypass Work	▲	▲		■	■	■
Bypass Test	▲	▲		■	■	■
Bypass Isolation	▲	▲				

▲Manual operation for master switch close/open; ■Manual operation for bypass switch close/open

For single bypass system, only bypass S1 close/open can be operated, and bypass S2 close/open can't be operated and the corresponding S2 close/open keys are invalid.

12.2 AUTOMATIC OPERATION

Controller shall be in auto mode by pressing the  button and a LED beside the button will illuminate. Controller can automatically transfer S1 or S2 power supply according to master settings and other conditions, meanwhile automatically control genset start according to main abnormal start and other start conditions.

12.3 SYNCHRONING CLOSE

Synchronizing close is transferring current power side to the other power supply under normal condition of both S1 and S2. During this process synchronizing transfer is needed.

Sync. Close Enable: when this is active, sync close function is active, otherwise sync. close function cannot be executed.

Sync. Volt Difference: Maximum volt difference between S1 and S2 at synchronization; if it is enabled, volt difference won't be detected in synchronizing process.

Sync. Freq. Difference: Maximum frequency difference between S1 and S2 at synchronization.

Sync. Phase Difference: Maximum phase difference between S1 and S2 at synchronization. Usually phase difference shall not be set too big. Otherwise, load impact will be too big at closing.

Fail to Sync Action: Warning alarm or fault alarm can be set; after sync failure, it continues waiting for sync until sync close is finished. For warning alarm when sync is completed or it exits from sync, alarm shall be cleared; for fault alarm, it needs alarm reset key to clear the alarm.

Transfer on Sync Fail: When this is enabled, after sync fails, non sync close will be conducted and no sync failure alarm shall be issued.

Fail to Sync Delay: Waiting time for sync; it shall issue sync failure alarm when it is overtime.

Breaker Feedback Time: Pulse time for synchronizing close; at the time of synchronizing transfer, sync close/open output delay starts; in the delay process if correct close status is detected, then stop the close/open pulse output; if after delay is over, correct close status still cannot be detected, close/open failure alarm shall be initiated.

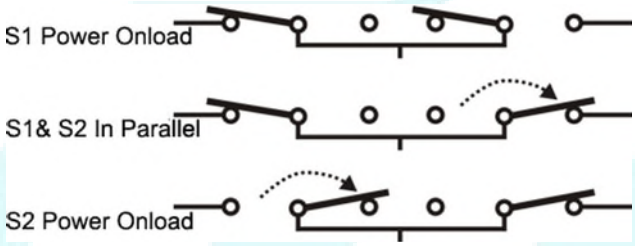


Fig. 3 - Sync Transfer Diagram

12.3.1 S1 SYNC CLOSE

S1&S2 power voltages are normal. S2 is onload, and S1 close pulse outputs. Until S1 close status is detected or delay is up to sync close/open detection time, disconnect S1 close pulse output. At the same time S2 open pulse outputs; until S2 open status is detected or delay is over sync close/open detection time, disconnect S2 open pulse outputs. In synchronizing process if close/open time is over sync close/open detection time, then close/open failure alarm is initiated.

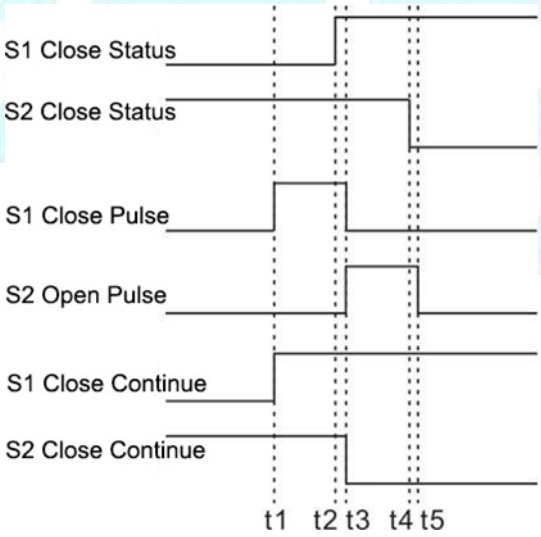


Fig. 4 - S1 Sync Close Procedure Oscillogram

12.3.2 S2 SYNC CLOSE

S1&S2 power voltages are normal. S1 is onload, and S2 close pulse outputs. Until S2 close status is detected or delay is up to sync close/open detection time, disconnect S2 close pulse output. At the same time S1 open pulse outputs; until S1 is opened or delay is over sync close/open detection time, disconnect S1 open pulse outputs. In synchronizing process if close/open time is over sync close/open detection time, then close/open failure alarm is initiated.

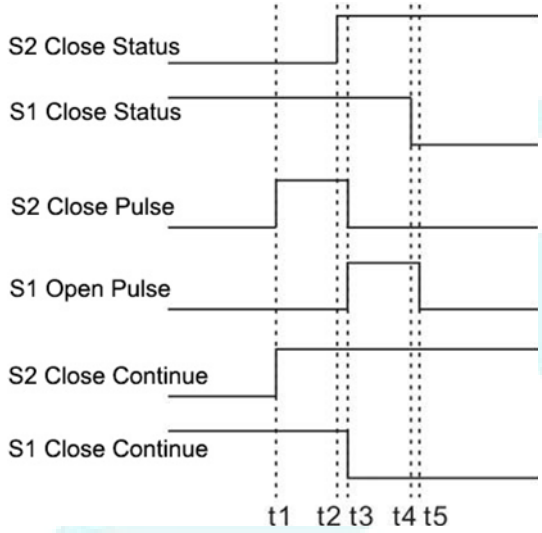


Fig. 5 - S2 Sync Close Procedure Oscillogram

12.3.3 MANUAL SYNC CLOSE

When it is manual mode, and S1&S2 power are normal, if S1 is closed, press S2 close key and S2 closes synchronously. If S2 is closed, press S1 close key, and S1 closes synchronously. In the process of waiting for sync, press close key again and sync close is stopped. If sync waiting is overtime, sync failure warning alarm is initiated; but it will continue waiting to sync, until sync is completed, or cancel sync close by pressing close key.

12.3.4 AUTO SYNC CLOSE

When it is auto mode and backup power is normal and backup is closed, master will sync close if master power recovers.

WARNING: when sync close is active, S1 and S2 may be in parallel. If system is S1 Mains S2 Mains, please do the locking on switch side to prevent S1 and S2 close at the same time. Otherwise, it may cause switch or lines burning or personal injury if it is serious.

13 ATS POWER SUPPLY

Switch Power Type can be set as DC Power or AC Power. If DC Power is selected, then the switch can be transferred at any time, even when both S1 and S2 are in outage. If AC Power is selected, whether the power is normal or not should be judged according to the AN voltage status of S1 and S2 and AC power voltage range.

The controller will intelligently control power supply when the power of ATS switch is from S1 and S2. As long as one voltage of S1 and S2 is normal, the controller can ensure ATS voltage power is normal and can be transferred properly. ATS power supply is outputted via LO and NO, and it will send close/open signal only when the controller detects normal voltage power.

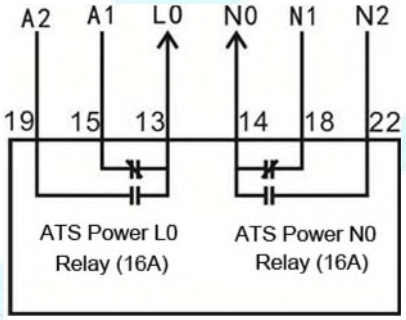


Fig. 6 - Internal Wiring of ATS Power LO-NO Output

14 NEL CONTROL

14.1 ILLUSTRATION

Non-essential load ---- NEL for short, refers to load can be ramped off in prior when genset power is out of shortage.

The controller can control the NEL1, NEL2 and NEL3 to trip separately. The order of the essentiality is: NEL3 > NEL2 > NEL1

14.2 AUTO OPERATION

NEL Trip Enabled: If the genset power has exceeded the NEL trip value, after the trip delay, NEL1 will trip the earliest, and then is NEL2, NEL3.;

NEL Auto Reconnection Enabled: If the genset power has fallen below the auto reconnection set value, after the auto reconnection delay, NEL3 will be reconnected the earliest, and next is NEL2, NEL1.

t1: NEL Trip Delay
t2: Reconnection Delay

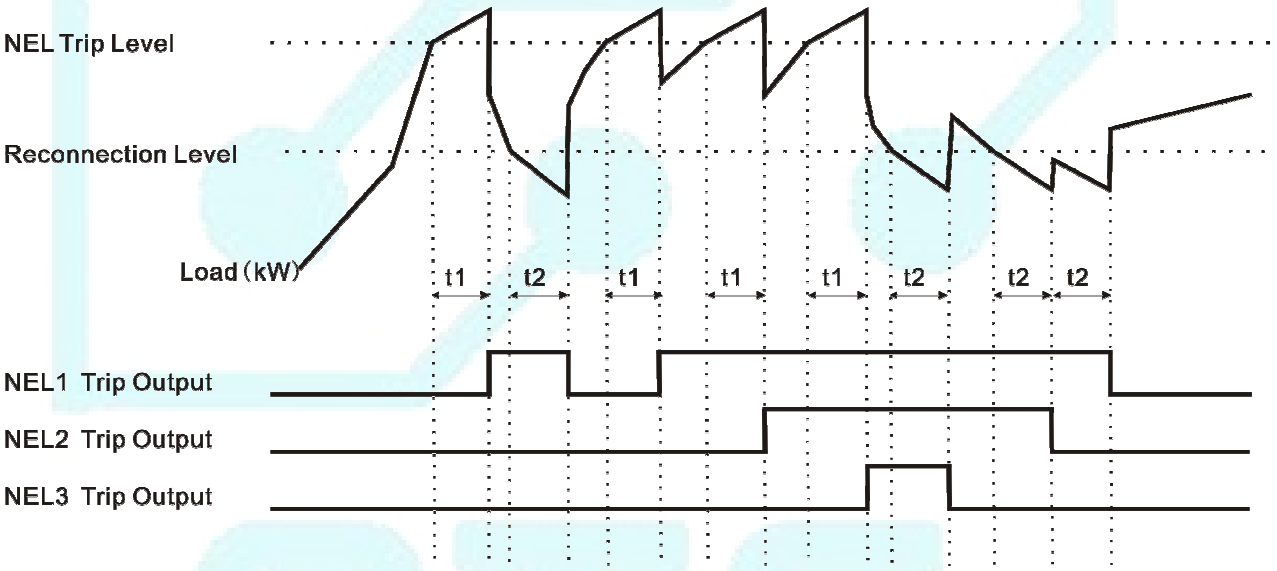


Fig. 7 - NEL Control Sequence Drawing

14.3 MANUAL OPERATION

If NEL manual trip input is active (earthed failing edge is active), NEL1 will trip without delay; If NEL manual trip input is active again, NEL2 will trip; If NEL manual trip input is active for the third time, NEL3 will trip. At this time the controller does not detect whether the genset power has exceeded the NEL trip value or not.

If NEL manual reconnection input is active (earthed failing edge is active), NEL3 will be reconnected without delay; If NEL manual reconnection input is active again, NEL2 will be reconnected; If NEL manual reconnection input is active for the third time, NEL1 will be reconnected. At this time the controller detects the genset power: if the genset power has fallen below the NEL reconnection value, then the input is active; if it doesn't, the input is deactivated.

NOTE6: When auto trip and auto reconnection are enabled, manual trip is still active.

15 COMMUNICATION CONFIGURATION

PTS-WST-8B ATS controller is with 2 RS485 communication ports, which allow it to connect LAN with open structure. It uses Modbus protocol via PC or system software, and provides dual power switching management plan to factories, telecom, industrial and civil buildings, realizing “remote control, remote measuring, remote communication” functions.

For details of communication protocol, please refer to *PTS-WST-8B Communication Protocol*.

Communication parameters:

Module address 1 (range: 1-254)
Baud rate 9600 bps (2400/4800/9600/19200bps)
Data bit 8-bit
Parity bit None (None, Odd Parity, Even Parity)
Stop bit 2 bits (1 bit or 2 bits)

There is a D-type USB port which can be used to connect with PC for software testing, parameter configuration and module software as well.

16 TERMINALS

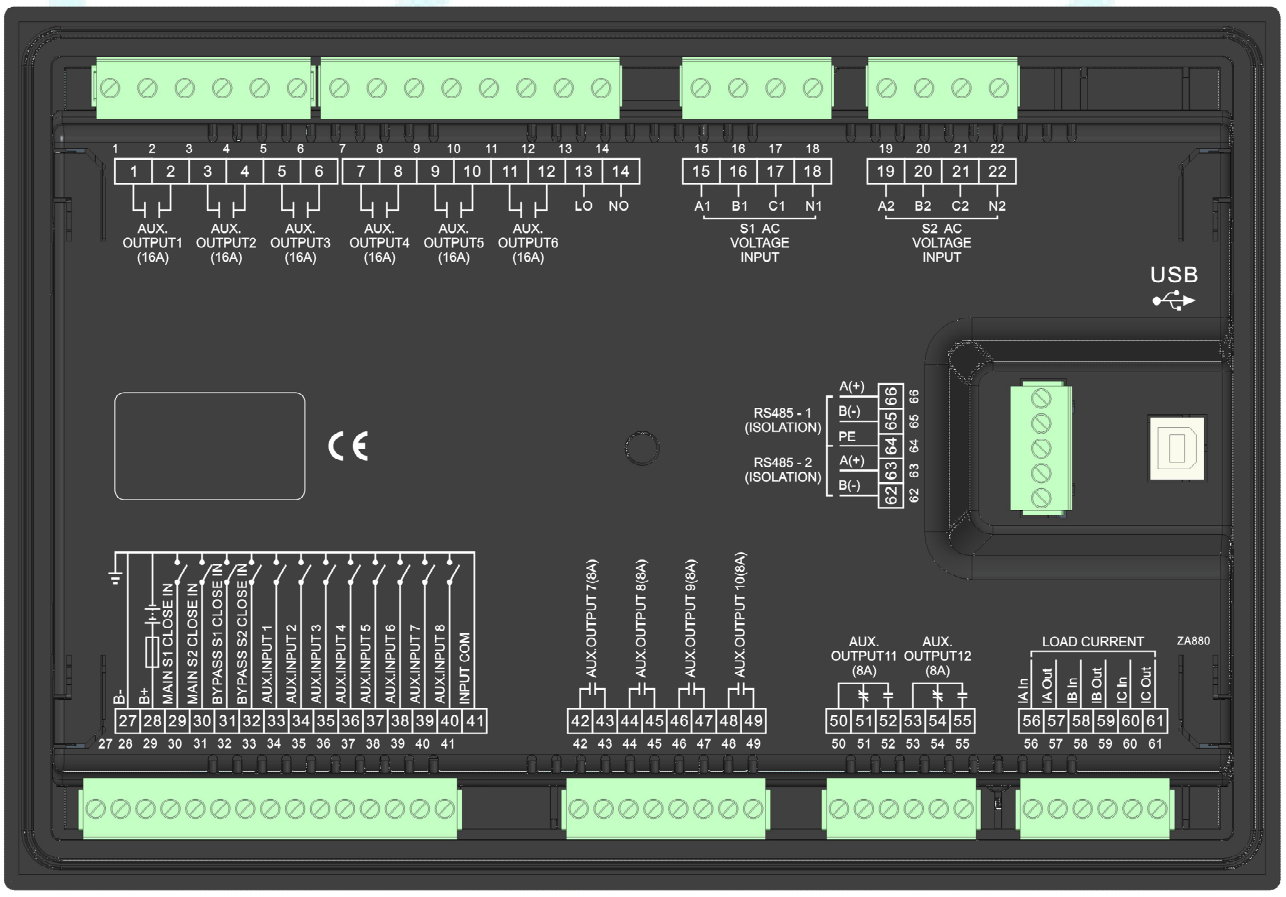


Fig. 8 - Controller Rear Panel Drawing

Table 23 - Inputs/Outputs Function Description

No.	Items	Description	Remark
1	AUX.OUTPUT1	Relay Output1	Default: MS1 Close Control; Volts free N/O output; Capacity: 250V16A
2			

No.	Items	Description	Remark
3	AUX.OUTPUT2	Relay Output2	Default: MS2 Close Control; Volts free N/O output; Capacity: 250V16A
4			
5	AUX.OUTPUT3	Relay Output3	Default: MS1 Open Control; Volts free N/O output; Capacity: 250V16A
6			
7	AUX.OUTPUT4	Relay Output4	Default: MS2 Open Control; Volts free N/O output; Capacity: 250V16A
8			
9	AUX.OUTPUT5	Relay Output5	Default: BPS1 Close Control Volts free N/O output; Capacity: 250V16A
10			
11	AUX.OUTPUT6	Relay Output6	Default: BPS2 Close Control Volts free N/O output; Capacity: 250V16A
12			
13	LO	ATS Power L	Power supply for ATS switching
14	NO	ATS Power N	
15	A1	S1 AC 3P4W voltage input	For single phase, only connect A1, N1.
16	B1		
17	C1		
18	N1		
19	A2	S2 AC 3P4W voltage input	For single phase, only connect A2, N2.
20	B2		
21	C2		
22	N2		
27	B-	DC negative pole	Ground terminal
28	B+	DC positive pole	DC (8-35)V input; controller power;
29	MAIN S1 CLOSE IN	Detect S1 close status, volt free contactor input	Ground connected is active.
30	MAIN S2 CLOSE IN	Detect S2 close status, volt free contactor input	Ground connected is active.
31	BYPASS S1 CLOSE IN	Detect BPS1 close status, volt free contactor input	Ground connected is active.
32	BYPASS S2 CLOSE IN	Detect BPS1 close status, volt free contactor input	Ground connected is active.
33	AUX. INPUT 1	Digital Intput1	Default: Forced Open Ground connected is active.
34	AUX. INPUT 2	Digital Intput2	Default: Breaker Trip Input Ground connected is active.
35	AUX. INPUT 3	Digital Intput3	Default: BTS Unlocked Status Ground connected is active.
36	AUX. INPUT 4	Digital Intput4	Default: ATS In Work Ground connected is active.
37	AUX. INPUT 5	Digital Intput5	Default: ATS In Test

No.	Items	Description		Remark
				Ground connected is active.
38	AUX. INPUT 6	Digital Intput6		Default: ATS Unlocked Status Ground connected is active.
39	AUX. INPUT 7	Digital Intput7		Default: BTS In Work Ground connected is active.
40	AUX. INPUT 8	Digital Intput8		Default: BTS In Test Ground connected is active.
41	INPUT COM	Ground terminal		Connect to B- internally.
42	AUX. OUTPUT 7	Relay Output7		Default: BPS1 Open Control Volts free Relay N/O output. Capacity: 250V8A
43				
44	AUX. OUTPUT 8	Relay Output8		Default: BPS2 Open Control Volts free Relay N/O output. Capacity: 250V8A
45				
46	AUX. OUTPUT 9	Relay Output9		Default: Parallel Warning Volts free Relay N/O output. Capacity: 250V8A
47				
48	AUX. OUTPUT 10	Relay Output10		Default: Not Used; Volts free Relay N/O output. Capacity: 250V8A
49				
50	AUX. OUTPUT 11	COM	Relay Output11	Default: Genset Start; Volts free; Relay N/C output. Capacity: 250V8A
51		N/C		
52		N/O		
53	AUX. OUTPUT 12	COM	Relay Output12	Default: Not Used Volts free; Relay N/O output. Capacity: 250V8A
54		N/C		
55		N/O		
56	IA In	CT Secondary A-Phase current input		
57	IA Out			
58	IB In	CT Secondary B-Phase current input		
59	IB Out			
60	IC In	CT Secondary C-Phase current input		
61	IC Out			
62	RS485-2 B(-)	RS485-2 communication port		120Ω impedance resistance should be connected externally according to on-site network organization.
63	RS485-2 A(+)			
64	PE	Ground terminal		
65	RS485-1 B(-)	RS485-1 communication port		120Ω impedance resistance should be connected externally according to on-site network organization.
66	RS485-1 A(+)			
USB	USB	Form D USB communication port		Parameter configuration and software upgrading via connecting with PC.

17 TYPICAL WIRING DIAGRAM

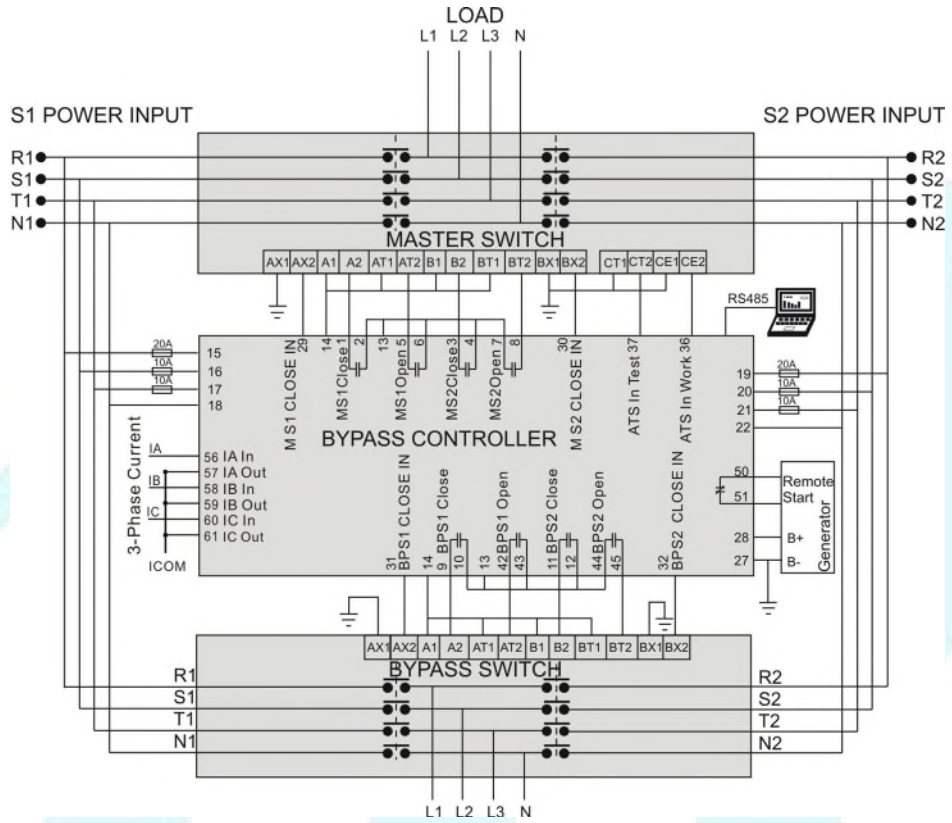


Fig. 9 - Remote Control Application Diagram of Dual Bypass

A1, A2: S1 close coil; AT1, AT2: S1 open coil; AX1, AX2: S1 close auxiliary status;
B1, B2: S2 close coil; BT1, BT2: S2 open coil; BX1, BX2: S2 close auxiliary status;
CT1, CT2: switch is in test. CE1, CE2: switch is in work position.

Table 24 - Remote Control Parameter Settings of Dual Bypass

Partial Parameter Setting	
Bypass function type	Dual bypass DBTSE
Bypass switch type	Remote bypass switch RTSE
Aux. Output 1	MS1 close control
Aux. Output 2	MS2 close control
Aux. Output 3	MS2 open control
Aux. Output 4	MS2 open control
Aux. Output 5	BPS1 close control
Aux. Output 6	BPS2 close control
Aux. Output 7	BPS1 open control
Aux. Output 8	BPS2 open control
Aux. Output 9	Parallel power warning
Aux. Output 11	Genset Start
Aux. Input 4	ATS is in work position.
Aux. Input 5	ATS is in test position.

18 INSTALLATION

Controller is panel built-in design; and it is fixed by clips when installed.

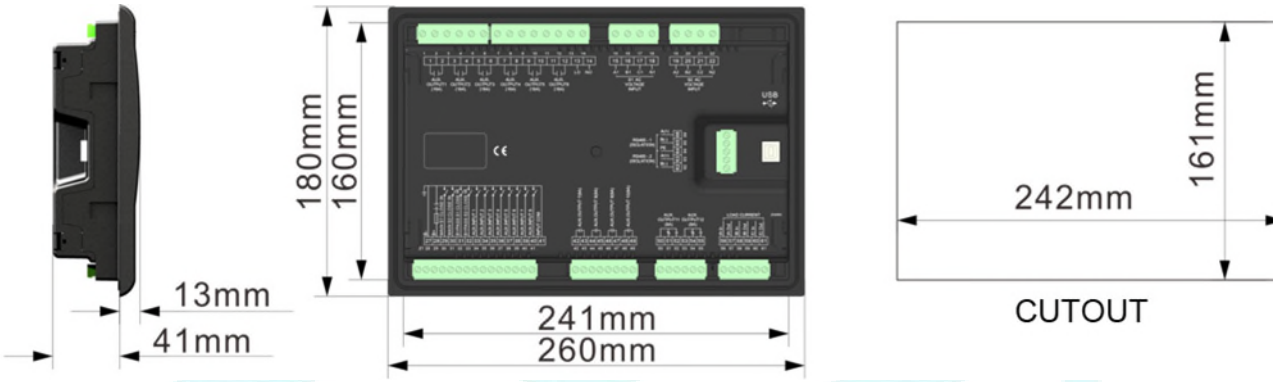


Fig. 10 - Overall & Cutout Dimensions

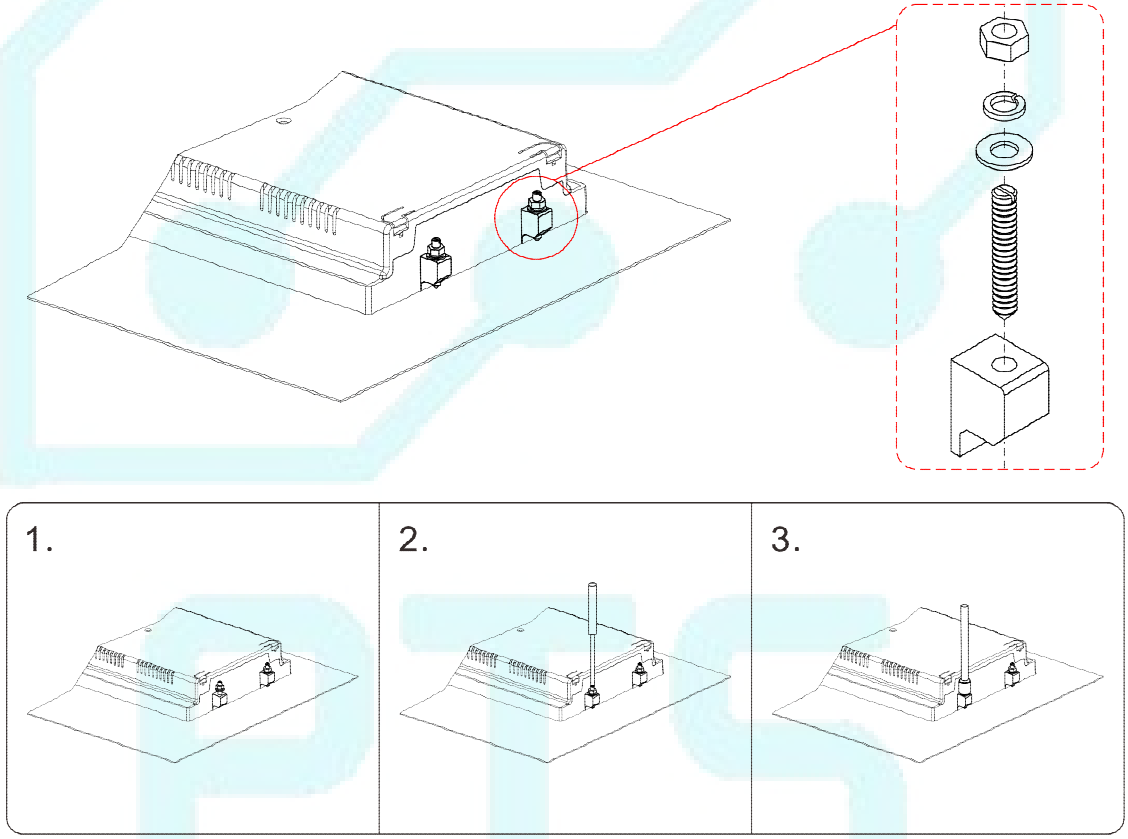


Fig. 11 - Clip Installation Drawing

Installation Steps:

1. Install 4 clip parts in turn and put into the grooves on front panel.
2. Tighten the 4 bolts in turn by using straight screwdriver.
3. Tighten the 4 hex nuts by using M4 nut driver.

19 TROUBLE SHOOTING

Table 25 - Troubleshooting

Symptoms	Possible Solutions
Controller no response with power.	Check DC voltage. Check DC fuse. Check AC Power supply.
RS485 communication is abnormal.	Check RS485's connections of A and B is reversely connected or not. Check RS485 transfer model is damaged or not. Check the module address in parameter setting is correct or not. If above methods can't solve the problem, parallel connecting 120Ω resistor between RS485 A terminal and B terminal is recommended.
Auxiliary Output Error	Check auxiliary output wiring, and pay attention to N/O contactor and N/C contactor. Check the output functions and output type settings in parameter settings.
Auxiliary Input Abnormal	Ensure that the auxiliary input is soundly connected to GND when it's active, meanwhile hung up when it is inactive. (⚠NOTE: The input port will be possibly destroyed when connected with high voltage) Check the input functions and active input type settings in parameter settings.
Genset running while ATS not transfer	Check ATS. Check the connection wirings between the controller and the ATS. Check ATS parameter settings.
Genset Start Abnormal	Check system type setting. Check the output function settings and output types in parameters settings. Check all Start/Stop settings.